

*This book belongs to*

---

"The earth was created with the assistance of the sun and it should be left as it was. I never said the land was mine to do with it as I chose. The only one with that right is the one who made it."

Chief Joseph of the Nezperce, 1870

This Handbook was written by Jim Bradley  
and illustrated by Bob Svec

*Handbook for the Selway Bitterroot*

SELWAY BITTERROOT WILDERNESS PRIMER

A HANDBOOK

WITH

Drawings, Checklists, Field Guides, Stories,  
Manuals, Glossaries, and Other Handy Information

United States  
Department of  
Agriculture

Forest Service  
Northern Region







Publication Number R1-78-23

# SELWAY BITTERROOT WILDERNESS

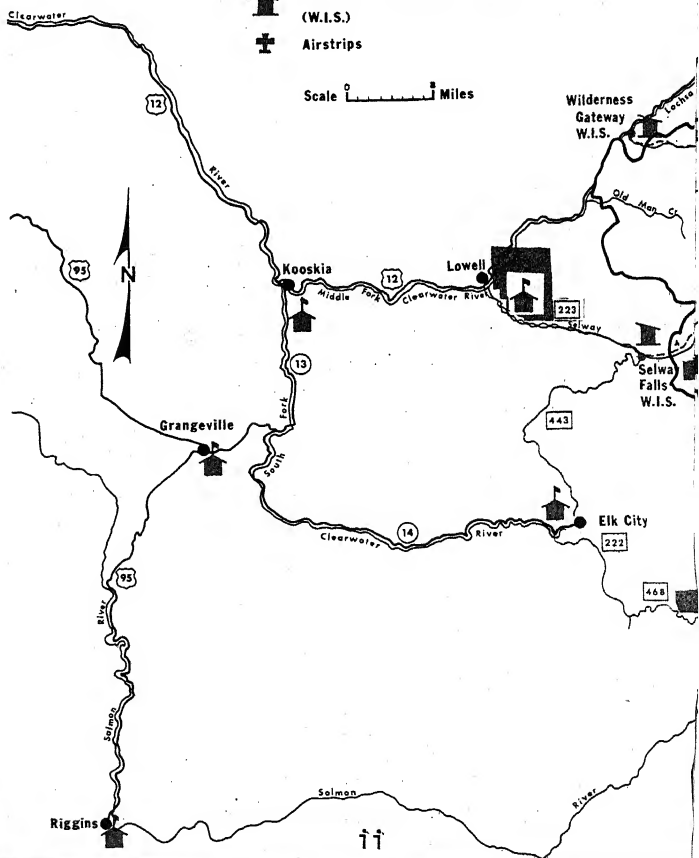
## BITTERROOT, CLEARWATER, LOLO AND NEZPERCE NATIONAL FORESTS

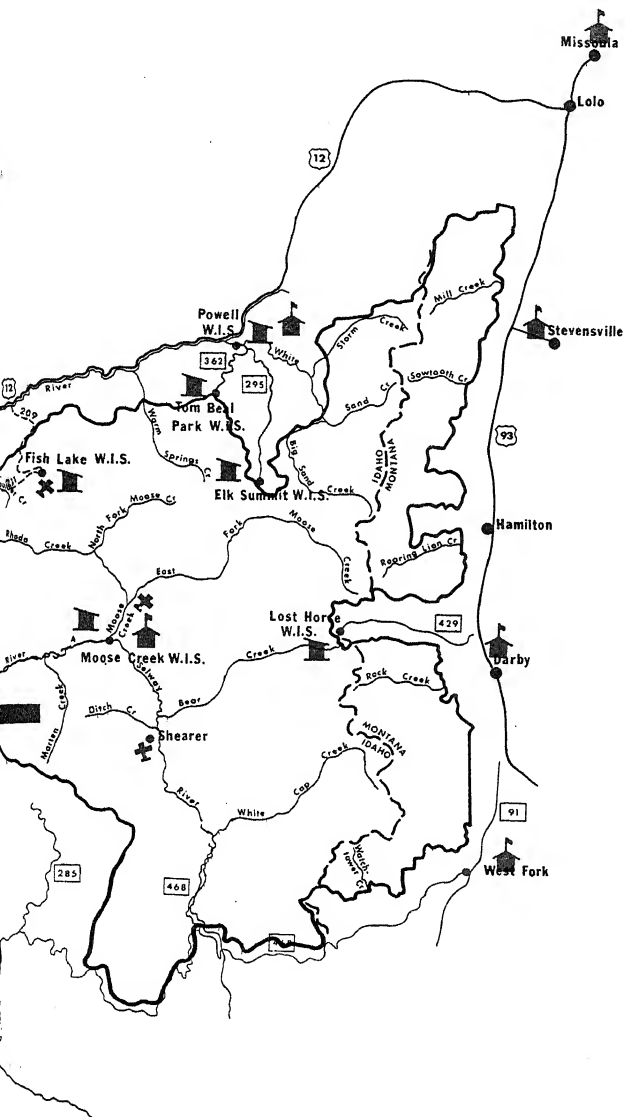
IDAHO AND MONTANA

### Legend

-  Roads
-  Trails
-  Wilderness Boundary
-  Ranger Stations
-  Wilderness Information Stations (W.I.S.)
-  Airstrips

Scale 0 1 2 Miles







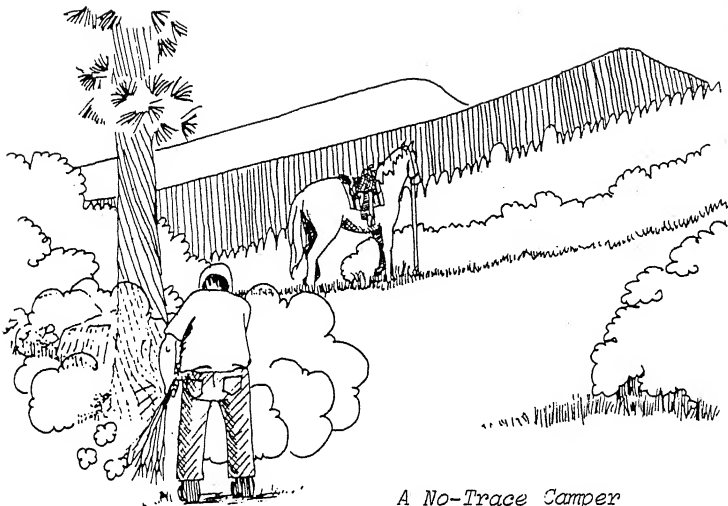
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"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

The Wilderness Act, 1964

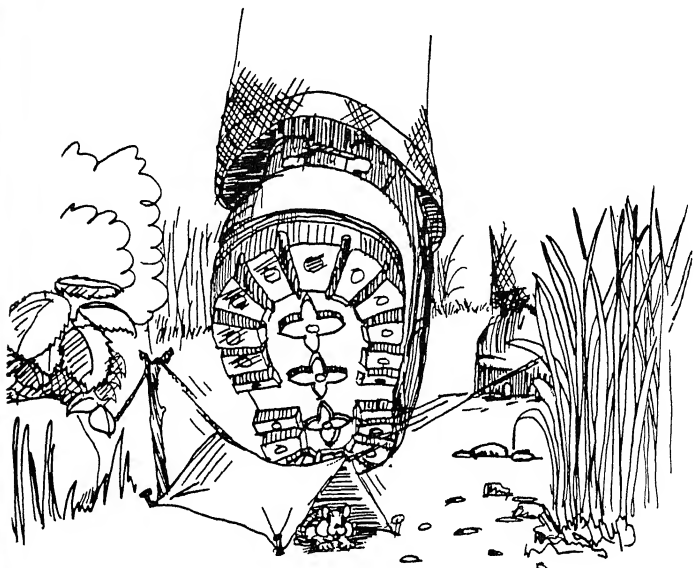


*A No-Trace Camper*

## THE NO-TRACE CAMPING SELF STUDY COURSE

There are six lessons on No-Trace Camping scattered through The Wilderness Primer. These pages have dark borders so you can find them easily. The object of the course is to teach you how to protect the beauty of the Selway-Bitterroot Wilderness during your visit. At the end of the Primer is a final exam.

Lesson #1 begins on the next page.



*The Wrong Choice*

## **NO-TRACE CAMPING**

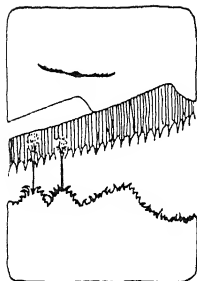
### **LESSON #1: CHOOSING A CAMPSITE**

Look for a site that:

\*is invisible from the main trail. Tents and packs with subdued earth toned colors can help hide your campsite from nearby campers and travelers on the trail. This will give other visitors a greater feeling of solitude.

\*is at least 200 feet from a lakeshore. Plants along the shore are easily trampled and killed by tents and campfires.

\*has a good place for a tent where you will not have to destroy vegetation by trenching or leveling.



## *Chapter I* *The Wilderness Act* *A Translation*

The Wilderness Act, passed by Congress in 1964, designated the Selway-Bitterroot Wilderness and today instructs the Forest Service on how to manage this and every designated wilderness.

### AN ENDURING RESOURCE

The Wilderness Act gives the American people the world's only National Wilderness Preservation System, a gift to unborn Americans as well as to us. On the first page, the Act states that "the benefits of an enduring resource of wilderness" are "for the American people of present and future generations." Designated to remain forever wild are some lands inside National Forests, National Parks, National Monuments, and National Wildlife Refuges. Today, because of further legislation, Bureau of Land Management lands, National Grasslands, and eastern roadless areas are eligible for wilderness designation as well. Only Congress can designate a wilderness.

The Selway-Bitterroot Wilderness' 1,240,000 acres lie within the boundaries of four National Forests and seven Ranger Districts.

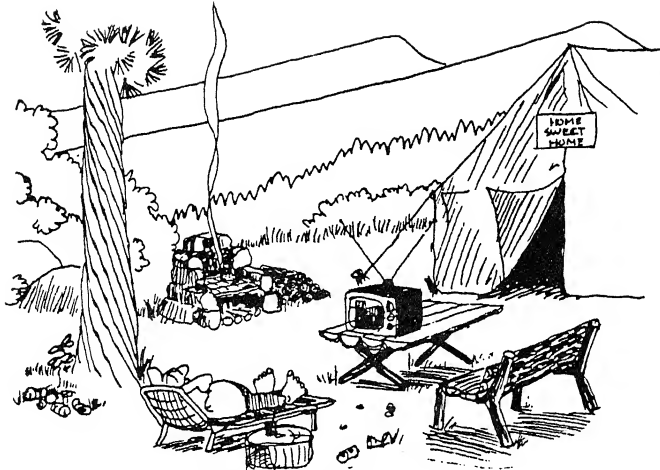
Section 2 of the Act gives the U.S. Forest Service a mandate. We must manage these acres so they actually are "an enduring resource," one that remains "unimpaired for future use and enjoyment as wilderness." This entails much more than just picking up garbage.

#### UNTRAMMELED BY MAN

A puzzling word stands out near the beginning of the Act's definition of wilderness, forcing readers to dust off their dictionaries. Howard Zahniser of the Wilderness Society carefully selected "untrammelled" to be a key word in this definition. When the Act defines wilderness as "an area where the earth and its community of life are untrammelled by man," many readers confuse trammeling with trampling and think that Congress simply asked us not to beat down the vegetation. The actual meaning is more profound. Defined as "uncontrolled or unrestricted," "untrammelled" as used in the Act creates a concept that makes a designated wilderness unlike any other land in the Nation. Here, man and his technology cannot attempt to control or restrict the plants, animals and natural forces. By Congressional decree, nature dominates and man cannot interfere with natural processes. The land must be managed "to preserve its natural conditions."

#### THE WILDERNESS EXPERIENCE

Before you enter the Selway-Bitterroot Wilderness, or any wilderness, ask yourself if you actually want a wilderness experience. The Act states that you can "use and enjoy" these lands "as wilderness." Since few people can agree on just what a wilderness experience is, Congress defined it as "outstanding opportunities for



*A Wilderness Experience???*

solitude or a primitive and unconfined type of recreation." Furthermore, "the imprint of man's work" must remain "substantially unnoticeable." Certain activities do not meet this criteria and a special paragraph prohibits them. They are...

- \* Commercial enterprises
- \* Roads and structures
- \* The landing of aircraft
- \* Motorized equipment
- \* Motor or mechanical transport

The remaining pages of the Act include exceptions to each of these prohibitions. Called special provisions, they are compromises, the result of eight years of debate between pro-and-wilderness forces. If Congress had not compromised, the Act never would have passed. The rewrite that finally triumphed on Capitol Hill allows bits of civilization inside wildernesses...

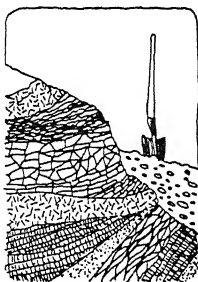


- \* Aircraft and motorboats may operate if their use was established before the Act was passed.

At present, the Selway-Bitterroot has three public airstrips (Fish Lake, Shearer, and Moose Creek). No new ones can be built and all aircraft including helicopters must confine their landings to these strips.

- \* Prospecting and mining are permitted, but the Secretary of Agriculture may issue "reasonable stipulations...for the protection of the wilderness character of the land."
- \* The Act allows hunting and fishing, but sportsmen must follow State fish and game regulations.
- \* Outfitters can operate commercial businesses so long as they provide services that "are proper for realizing the recreational or other wilderness purposes of the areas."
- \* Livestock can graze if this use was established before the Act was passed.
- \* The President can authorize water developments and power projects. These could include reservoirs, transmission lines, and roads.
- \* Owners of private property surrounded by wilderness are allowed "adequate access" to their land and wilderness regulations do not apply to their property. The Selway-Bitterroot has four private homesteads, each with buildings and an airstrip. The Burlington Northern Railroad also has holdings inside the Wilderness boundary.

- \* The Act allows the Forest Service to use the minimum means necessary to administer wildernesses. This permits limited use of motorized equipment and a few facilities such as fire lookouts, trails, bridges and cabins. We also can do whatever is necessary to suppress forest fires or to rescue lost or injured visitors.



## *Chapter II* *A Feel For the Land*

### **THE MOUNTAIN BUILDING MANUAL**

After visiting the Selway-Bitterroot Wilderness, many people wish they had their own Bitterroot Mountains back home. Now, with this do-it-yourself manual, you can build a replica of the Bitterroots using the same five steps developed by nature.

#### **Helpful hints:**

1. Rope off a 14,000-square mile work area.
2. Don't rush! You will need three billion years to do a quality job.
3. Guard against burns. You must heat your rocks to 1600°F. or more to melt them into magma (molten rock).
4. Stay alert when carving with glaciers. They crush everything in their paths.

#### **Materials:**

1. The earth's crust (the 25-mile thick outer skin that covers the planet)
2. Hot, semi-solid rock below the crust

3. A shallow ocean

4. Rain and snow

Step 1: Allow silt to collect on the bottom of the ocean for 2.9 billion years. Layers of mud and sandstones will pile up until they are so heavy that heat and pressure will change the rocks on the bottom into gneisses and schists. If your results are similar to the gneisses and schists on the eastern slopes of the Bitterroot Mountains, go to step 2.

Step 2: Work faster! You have only 100 million years to complete your project. Push against the earth's crust with the hot, semi-solid rock that is below. The crust will break into blocks. Stack up these blocks to build mountains.

Step 3: Melt the rocks inside these blocks into magma. As this molten rock rises, the magma will cool and crystalize. The result will be a buried mass of granitic rocks. The older rocks on top will erode and gradually expose the granitics below until pink granite and quartz monzonite become the dominant rocks in the mountains.

Step 4: The heavy construction is done. Concentrate the last three or four million years of the project on polishing and refining. Two tools are necessary -- rivers and glaciers. Make them yourself by increasing the rain and snowfall. Rivers will begin to carve steep "V-shaped" canyons. Soon more snow will fall in the mountains than the summer heat can melt, and glaciers will move down from the peaks. These ice dozers will scoop out lake basins (glacial cirques) and wide "U-shaped" valleys. When they reach 4,000 feet above sea level, melt the glaciers by decreasing the precipitation. Repeat this ice age four times.

Step 5: Let the mountains erode on their own for ten thousand years. If not satisfied with the final product, start a fifth ice age.

Warning: The mountains are not as sturdy as they look. The soils formed from granitic rocks erode easily, particularly if horses and mules graze steep hillsides or cut switchbacks. If your neighbors visit your mountains, make sure they appreciate the work involved in building them -- otherwise, you may discover initials painted on your favorite antique rocks, granitic crystals blackened by campfires, and garbage in the "U-shaped" valleys.

## TRAILSIDE ROCKS

There are three types of rocks -- igneous, sedimentary, and metamorphic. Igneous rocks dominate the Selway-Bitterroot Wilderness. These are formed when hot liquid rock (magma) cools either above or below the ground. Look for...

1. Granitics (pink granite, quartz monzonite, and granodiorite). Its large crystals indicate that the liquid rock cooled very slowly beneath the earth's surface. These are the most common rocks in the Selway-Bitterroot.

### Clues

- \* Large crystals or grains
  - \* Salt and pepper coloring (light colored grains mixed in with dark colored ones.
  - \* No linear bands
  - \* Quartz (looks glassy)
  - \* Mica
2. Rhyolite/Dacite. Its tiny crystals indicate that the molten rock cooled rapidly on the earth's surface.

### Clues

- \* Tiny grains or crystals sometimes surrounding a large crystal
- \* Light-colored

Metamorphic rocks are formed from older rocks when heat and pressure from the layers of rocks above change their appearance and structure. In Montana, east of the Bitterroot Divide, look for...

#### 1. Gneiss (pronounced "nice")

### Clues

- \* Medium-sized grains or crystals in parallel dark and light bands
- \* Hard, difficult to break apart in your hands

#### 2. Schist

### Clues

- \* Medium-sized grains and crystals arranged in a jumble
- \* Variety of colors
- \* Soft and flaky, often easy to break apart in your hands

Sedimentary rocks are formed when shells or pieces of older rocks such as sand cement together. They are rare in the Selway-Bitterroot.

## THE FOREST FIRE QUIZ

Imagine a forest fire. Do you picture a sweeping wall of flames, torching trees, fleeing animals, death and destruction everywhere? Do you picture a black, lifeless landscape afterwards? If you are like most people, you probably think of fire as an enemy of the wilderness. But is this the truth? Is fire the villain we always assumed it to be? We challenge you to test how much you really know about fire by taking the "Forest Fire Quiz."

(Mark each statement true or false)

1. Most forest fires in the Selway-Bitterroot Wilderness are caused by careless campers.

Lightning ignites over 90 percent of the forest fires in the Selway-Bitterroot and in most of the Northern Rockies. Charcoal found in ancient bogs indicates that lightning fire has been a natural force for at least 11,000 years. False.

2. Most fires burn an acre or more.

Two-thirds of the fires in the Selway-Bitterroot Wilderness are less than one quarter of an acre. False.

3. Due to modern firefighting techniques, the potential for large forest fires today is smaller than in the past.

By suppressing all forest fires, we have created a potential for the fires of the future to be bigger and hotter. Dead branches, logs, and needles pile up on the forest floor. The debris accumulates until it becomes dangerous fuel that finally explodes into a major blaze. False.

4. Because fire destroys the cones with their seeds, many years pass before tree seedlings grow on a burned mountain slope.

Many cones survive that are buried in the forest floor or are still hanging in the treetops. The cones of lodgepole pines actually need fire to release their seeds. Each cone is glued shut by a resinous coating. Squirrels sometimes pry the scales apart, but usually heat from the sun or, more often, a fire must melt the resin before the seeds can spill to the ground. A forest fire can release so many seeds that in only a few years, 30,000 lodgepole seedlings may cover each acre of the old burn. False.

5. Fire kills most of the animals that live in the burning forest.

Fire does not deserve its reputation as a killer. Most warm-blooded animals escape. False.

6. For years after a forest fire, there is little food for wildlife.

The surprising truth is there often is more food after a fire than before. In only a few weeks, hillsides are not black, but green. In only a few years, they are not barren and eroding, but jungles of shrubs. By opening up the forest so more sunlight reaches the ground, fire allows these shrubs to sprout and thrive. Many bushes, such as redstem ceanothus, are important browse for elk and deer. Not only is there more browse after a fire, but now it is richer in protein. Before a blaze, important nutrients are locked up in dead logs and branches. The flames release them to filter into the soil, be absorbed by new plants, and eventually become nutritious food for wildlife. False.



8. Even though the Wilderness Act of 1964 prohibits motorized equipment, the Forest Service can use chainsaws and helicopters to put out forest fires.

The Act allows the Forest Service to use motorized equipment in emergencies, in wilderness administration, and in fire suppression. See Chapter I. True.

9. The Forest Service should help the plants and animals by suppressing all fires in the Selway-Bitterroot Wilderness.

Fire in the wilderness is like the wind, snow, and rain -- neither good nor bad for living things, simply a force of nature. The Wilderness Act instructs the Forest Service to manage the Selway-Bitterroot "so as to preserve its natural conditions." Instead of eliminating lightning fires, we are partially restoring them to their natural role. In carefully selected drainages of the Selway-Bitterroot Wilderness, we have established a natural fire program. This does not mean that huge fires roar unchecked through the mountains. All fires are closely observed by specially trained fire monitors. Some are suppressed to protect property and to prevent flames from crossing the wilderness boundary. False.

10. It is just as important to prevent man-caused fires inside the wilderness as in forests with valuable commercial timber.

Man-caused forest fires are not a force of nature. They do not belong inside or outside wildernesses. The Forest Service will continue to suppress them and we hope that you will continue to prevent them. True.



## **NO-TRACE CAMPING**

### **LESSON #2: YOUR CAMPFIRE**

Campfires can leave unnecessary signs of man's presence in the Wilderness. The best way to prevent a campfire scar is to use a portable stove and not build a fire at all. If you build a fire, here are some ways to lessen its impact.

1. Use only fallen dead wood. Avoid cutting down snags. These standing dead trees provide homes for many animals.

2. Keep your fire small. This conserves wood and reduces the size of the fire scar.
3. To prevent your fire from spreading, clear away the duff and litter until you reach dirt. Make sure there are no overhanging branches or severe winds. A ring of rock is not necessary. Rocks do little to contain a campfire and the flames will color them an unsightly black.
4. Never leave your fire unattended.
5. Erase all trace of your fire before you leave. (See Lesson #6 on page 67 .)

## **FIELD GUIDE TO COMMON CONE BEARING TREES**

- \* Designed exclusively for those who are without degrees in botany
- \* No unreadable Latin names, no complicated keys
- \* Includes only the needle and cone-bearing trees that are easy to see along the trail

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### PINES

Needles attached to the twig in bundles (fascicles) of two or more

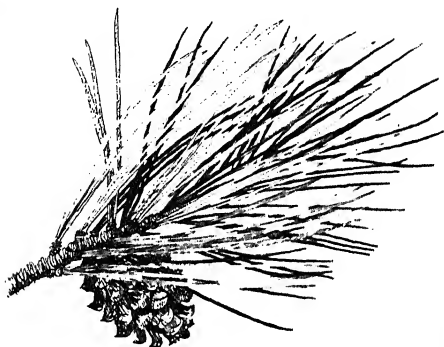
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\* Three long needles in a bundle

\* The larger trees have thick orange bark

\* Each scale of the cone has a barb at the tip



## 1. Ponderosa or Yellow Pine

### Community Notes

- \* Elevation - 1,000 to 3,500 feet
- \* When overgrazed by stock, the grasses are slow to recover. Elk and deer need this browse when the high country is snowed in.
- \* Ponderosas dominate some slopes because of natural forest fires. While the flames kill other species of trees that would compete for space and water, the ponderosa pine survives because of its special bark. As the bark's outer layers burn, they flake off, carrying away the heat. This protects the growing parts of the trunk. Layers of paint protect space capsules re-entering the atmosphere in the same way.



\* *Two needles in a bundle*

\* *Cones smaller than those of ponderosa but otherwise similar*



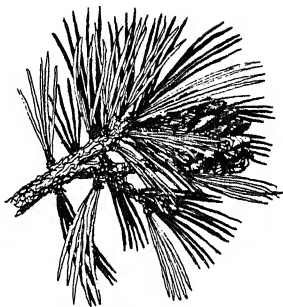
## 2. Lodgepole Pine

### Community Notes

- \* Elevation - 3,500 to 7,000 feet
- \* These trees indicate the presence of past forest fires. Fire opens the cones and releases the seeds. The seedlings which thrive in sunlight are the first trees to grow in a burned area.
- \* Without fire, lodgepole pines eventually are replaced by trees whose seedlings grow in shade.
- \* Too often these trees are killed for tent poles, meat racks, and makeshift furniture.

\* *Five needles in a bundle*

\* *Long cones with no barbs*



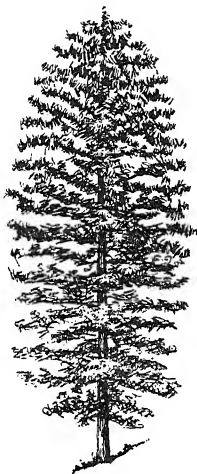
### 3. Whitebark Pine

#### Community Notes

- \* High elevations near timberline
- \* Harsh conditions: wind, snow, cold, short growing season.
- \* Plants grow slowly. A four or five foot tree may be over 100 years old.
- \* Destroyed vegetation may take decades to recover. Protect even the smallest plants.

\* *Five long soft needles  
in a bundle*

\* *The longest cone in the  
Selway-Bitterroot*



#### 4. Western or Idaho White Pine

##### Community Notes

- \* Elevation - 3,500 to 5,500 feet
- \* Rare in the Selway-Bitterroot.
- \* Protect these trees and their seedlings to ensure their continued survival in the Selway-Bitterroot.

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## LARCHES

Needles arranged in circles at the end of short spurs jutting out from the branch.

Needles turn bright yellow in autumn.

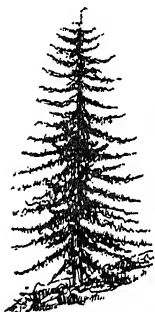
Loses all needles by winter.

Cones less than an inch long.

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\* *Four sided needles*

\* *Cone scales have longer fringes than western larch*



### 1. Alpine Larch

#### Community Notes

- \* High elevations near timberline on the Bitterroot Crest.
- \* Harsh conditions: wind, snow, cold, short growing season.
- \* Plants grow slowly. A four or five foot tree may be over 100 years old.
- \* Destroyed vegetation may take decades to recover. Protect even the smallest plants.





\* *Three sided needles*

\* *Tiny fringes on the scales of cones*

\* *Thick bark*



## 2. Western Larch

### Community Notes

- \* Elevation - 3,500 to 5,500 feet
- \* Moist conditions, long growing season.
- \* These trees indicate a past forest fire. Their seedlings thrive when fire has opened the forest floor to sunlight. The thick bark of the mature trees helps protect them from the flames.
- \* Sometimes a good site for stock because plants in the area recover quickly.

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### FIRS

Needles attached to twig singly -- not in clusters or circles.

Needles flat, not triangular, with blunt, not sharp, tips.

Cones erect on the branch instead of hanging down.

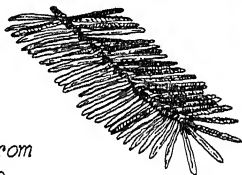
Usually no cones on the ground. They fall apart while still attached to the branch (sometimes squirrels cut them off intact).

Round -- not sharp pointed -- buds.

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*\* Needles extend horizontally from the twig on two sides*



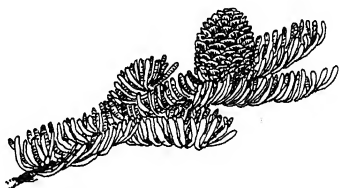
## 1. Grand Fir

### Community Notes

- \* Elevation - 1,000 to 5,500 feet
- \* Moist conditions, long growing season, plants grow rapidly.
- \* Sometimes a good site for stock because plants in this area recover quickly.
- \* These trees grow close to streams. Human wastes, washing with soap, and holding stock too close to the bank can pollute the water.

\* *Needles encircle  
the twig*

\* *Tree is shaped like a  
spire*



## 2. Subalpine Fir

### Community Notes

- \* Elevation - 4,000 feet to timberline
- \* Cold climate, short growing season.
- \* Vegetation recovers slowly when disturbed. The many lakes and meadows in this community have man-made scars that have lasted for years. When the vegetation is killed, the soils erode easily.
- \* Protect the plants and prevent erosion by limiting your grazing, not cutting switchbacks, and by camping and containing stock well away from a lakeshore.

\* Needles triangular and thin

\* Cones have paper thin bracts (wings) with a long tip extending out from between scales

\* Buds end in a sharp point

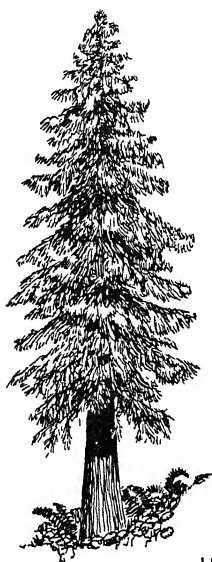


### DOUGLAS-FIRS

There is only one species of this genus in the Selway-Bitterroot

#### Community Notes

- \* Elevation - 1,000 to 5,500 feet.
- \* This community needs frequent small lightning-caused ground fires to clean up dead debris on the forest floor. Without fire, dead logs, branches, and needles pile up, eventually becoming fuel for a much bigger fire.
- \* So many mice, moles, squirrels, chipmunks, insects and birds eat Douglas-fir seeds that some years few survive to sprout.



\* *Foliage is composed of small scale-like leaves less than 1/4 inch long*

\* *Twig slender, flattened and drooping*

\* *Cones very small and erect*



#### WESTERN REDCEDAR

Only one species is found in the Selway-Bitterroot.

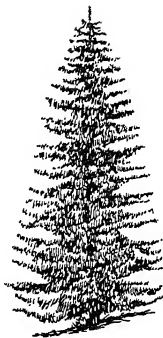
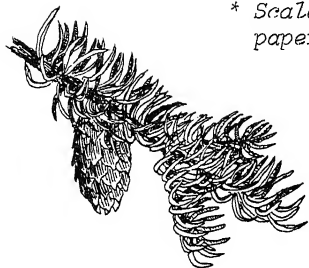
#### Community Notes

- \* Along creeks at low elevations
- \* Very moist conditions.
- \* Some small plant species on the forest floor are unique. Several have been recommended for classification as threatened species. Protect even the smallest plants.
- \* Horses and mules eat redcedar bark. Prevent them from stripping the bark from the trees and killing them.

\* Needles are angular with sharp tips that prick when touched

\* Cones hang from the branch

\* Scales of cones are paper-like



### ENGELMANN SPRUCE

Only one species is found in the Selway-Bitterroot.

#### Community Notes

- \* Elevation - 3,500 to 7,000 feet
- \* Cold climate, short growing season.
- \* Vegetation recovers slowly when disturbed. The many lakes and meadows in this community have man-made scars that have lasted for years. When the vegetation is killed, the soils erode easily.
- \* Protect the plants and prevent erosion by limiting your grazing, by not cutting switchbacks, and by camping and containing stock well away from a lakeshore.
- \* Spruce have shallow roots and topple over easily in a windstorm. Be careful in choosing a spot to place your tent!



### PIKA

- \* *Found in rock slides at high elevations.*
- \* *Listen for a high pitched squeaking.*
- \* *Makes hay from flowers and grasses by curing them in the sun and then storing them under the rocks.*
- \* *Does not hibernate in the winter, but travels under the snow in tunnels that connect its "hay barns." Tiny ears and feet and no tail help preserve the pika's body heat.*

# THE WILDLIFE CHECKLIST

## THE WILDLIFE CHECKLIST

To show you the great diversity of animal life in the Selway-Bitterroot Wilderness, we have included all animals found in the wilderness except insects. The species underlined use standing snags as part of their habitats.

### I. Mammals

#### A. Ungulates (hoofed animals)

1. elk
2. whitetailed deer
3. mule deer
4. moose
5. mountain goat
6. bighorn sheep

- #### B. Rodents & Lagomorphs (gnawing mammals)
1. porcupine
  2. muskrat
  3. beaver
  4. yellowbelly marmot
  5. hoary marmot
  6. pika

#### 7. mountain cottontail

8. snowshoe hare
9. Columbian ground squirrel
10. golden mantled squirrel
11. red or pine squirrel
12. northern flying squirrel
13. least chipmunk
14. yellow pine chipmunk
15. northern pocket gopher
16. deer mouse
17. bushy tail woodrat
18. boral redback vole
19. mountain phenacomys
20. meadow vole
21. mountain vole
22. longtail vole
23. Richardson vole

#### C.

#### Carnivorous mammals (meat eaters)

1. black bear (also eats berries & roots)
2. mountain lion
3. coyote
4. badger
5. fisher
6. spotted skunk
7. striped skunk
8. lynx
9. bobcat
10. otter
11. wolverine
12. pine marten
13. short tailed weasel
14. long tailed weasel



# D. Shrews

1. — masked shrew
2. — vagrant shrew
3. — dusky shrew
4. — northern water shrew

# E. Bats

1. — little brown myotis
2. — yuma myotis
3. — long eared myotis
4. — fringed myotis
5. — long legged myotis
6. — California myotis
7. — silver haired bat
8. — big brown bat
9. — hoary bat
10. — western big eared bat

# II. Birds

## A. Raptorial (birds with sharp curved claws)

1. — Goshawk
2. — sharp-shinned hawk
3. — Cooper's hawk
4. — redtailed hawk
5. — golden eagle
6. — osprey

# 7.

— prairie falcon

— merlin (pigeon hawk)

— screech owl

— flamulated owl

— great horned owl

— pygmy owl

— long eared owl

— boreal owl

— saw whet owl

— sparrow hawk

# B. Grouse

1. — Blue grouse

2. — Franklin's grouse

3. — ruffed grouse

Insect & Seed Eaters

1. — gray jay

2. — Stellar's jay

3. — blackbilled magpie

4. — common raven

5. — Clark's nutcracker

6. — black-capped chickadee

7. — mountain chickadee

8. — chestnut-backed chickadee

9. — white-breasted chickadee

10. — red-breasted nuthatch

11. — pygmy nuthatch

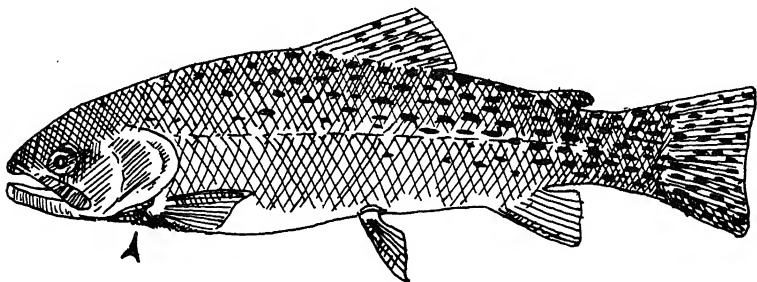
# C. Insect & Seed Eaters

12. — brown creeper
13. — water ouzel (dipper)
14. — house wren
15. — winter wren
16. — canon wren
17. — rock wren
18. — catbird
19. — robin
20. — varied thrush
21. — hermit thrush
22. — Swainson's thrush
23. — veery
24. — western bluebird
25. — mountain bluebird
26. — Townsend's solitaire
27. — golden-crowned kinglet
28. — ruby-crowned kinglet
29. — cedar waxwing
30. — warbling vireo
31. — orange-crowned warbler
32. — yellow warbler
33. — Nashville warbler
34. — Audubon's warbler
35. — Townsend's warbler
36. — Wilson's warbler
37. — yellow-breasted chat
38. — American redstart
39. — Bullock's oriole

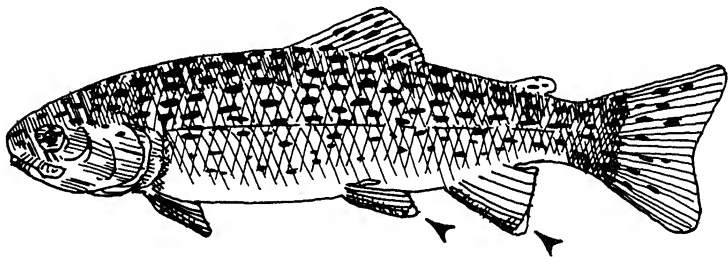
- |       |                                |                 |                           |                                    |  |
|-------|--------------------------------|-----------------|---------------------------|------------------------------------|--|
| 40. — | Brewer's blackbird             | 63. —           | American goldfinch        | 3. —                               | northern long-toed                           |
| 41. — | Brown-headed cowbird           | 64. —           | red crossbill             | 4. —                               | salamander                                   |
| 42. — | common nighthawk               | 65. —           | Rufous-sided towhee       | 5. —                               | Coeur d'Alene                                |
| 43. — | Vaux's swift                   | 66. —           | Savannah sparrow          | 6. —                               | salamander                                   |
| 44. — | broad-tailed hummingbird       | 67. —           | chipping sparrow          | 7. —                               | western (boreal) toad                        |
| 45. — | Rufous hummingbird             | 68. —           | Brewer's sparrow          | 8. —                               | tailed frog                                  |
| 46. — | Calliope hummingbird           | 69. —           | White-crowned sparrow     | 9. —                               | Pacific tree frog                            |
| 47. — | belted kingfisher              | 70. —           | fox sparrow               | 10. —                              | spotted frog                                 |
| 48. — | red-shafted flicker            | 71. —           | Lincoln's sparrow         | IV. Reptiles                       |  |
| 49. — | pileated woodpecker            | 72. —           | Song sparrow              | 1. —                               | Rocky Mt. rubber boa                         |
| 50. — | Lewis woodpecker               | 73. —           | Oregon junco              | 2. —                               | Great Basin garter snake                     |
| 51. — | hairy woodpecker               | 74. —           | yellow-bellied sapsucker  | 3. —                               | valley (common) garter snake                 |
| 52. — | downy woodpecker               | 75. —           | Williamson's sapsucker    | 4. —                               | western garter snake                         |
| 53. — | black-backed 3-toed woodpecker | 76. —           | Traill's flycatcher       | 5. —                               | western skink                                |
| 54. — | northern 3-toed woodpecker     | 77. —           | Hammond's flycatcher      | 6. —                               | western rattlesnake                          |
| 55. — | western tanager                | 78. —           | dusky flycatcher          | (Crotalus viridis)                 |  |
| 56. — | black-headed grosbeak          | 79. —           | olive-sided flycatcher    | V. Threatened & Endangered Species |  |
| 57. — | Lazuli bunting                 | 80. —           | western-wood pewee        | 1. —                               | grizzly bear (no recent confirmed sightings) |
| 58. — | evening grosbeak               | 81. —           | violet-green swallow      | 2. —                               | - threatened                                 |
| 59. — | Cassin finch                   | 82. —           | tree swallow              | 3. —                               | peregrine falcon                             |
| 60. — | house finch                    | III. Amphibians |                           | —                                  | - endangered                                 |
| 61. — | pine grosbeak                  | 1. —            | Pacific giant salamander  | —                                  | —  |
| 62. — | pine siskin                    | 2. —            | blotched tiger salamander | —                                  | - endangered                                 |

## FISH IDENTIFICATION

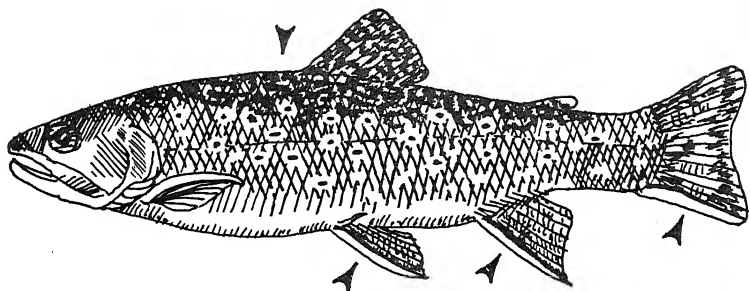
\* See arrow on illustrations.



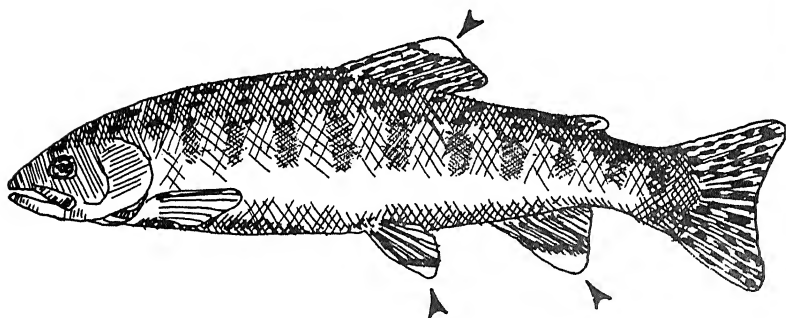
Cutthroat Trout - Back is grey to greenish, sides yellow brown; belly pink; lower \*edge of gills and under lower jaw bright red-orange; irregular dark spots mostly on posterior portions of back and sides. They are native to this area.



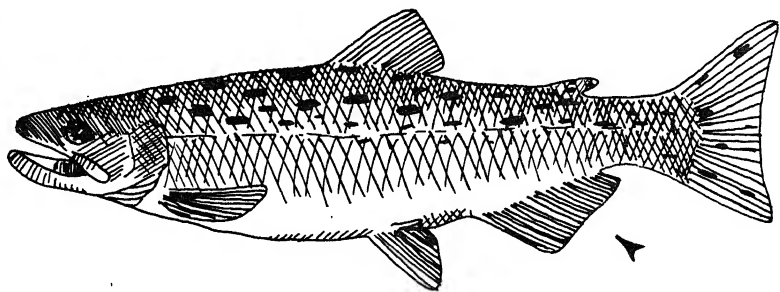
Rainbow Trout (Steelhead Trout) - Color variable -- silvery in lakes -- otherwise, back is olive to blue-green; sides pink shading; irregular small dark spots on back and sides from head to tail; \*white tip on anal and pelvic fins. Steelhead are trout which migrate to sea and return in 1-2 years as adults. They are native to this area.



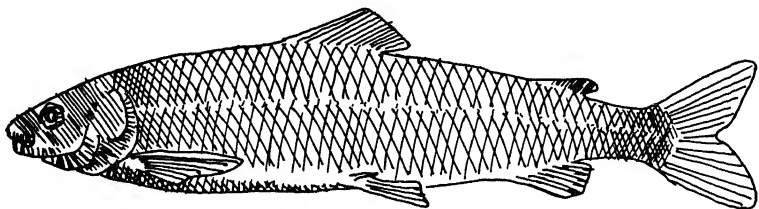
Brook Trout - Back is dark green to blue-black, shading to white on belly. Males may have red on belly and lower fins when spawning; \*upper body and dorsal fin have a dark mottled wormlike pattern; sides have yellow and pink spots with a bluish halo; \*all lower fins have white then dark stripe on leading edge. Originally native to eastern U.S.



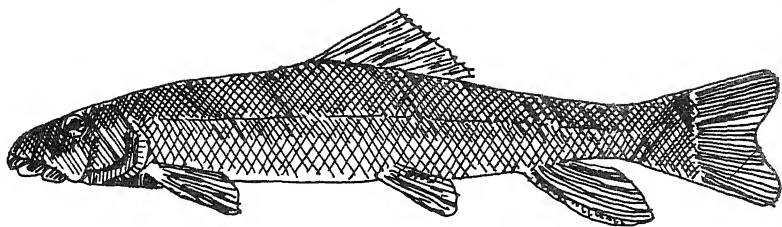
Golden Trout - Back is green or olive; red-pink band on sides interrupted by large bluish spots, remaining area on sides light gold; red shading on lower surfaces; \*dorsal, pelvic and anal fins have white tip offset by black bar. Found only in certain high elevation lakes, originally native only to California.



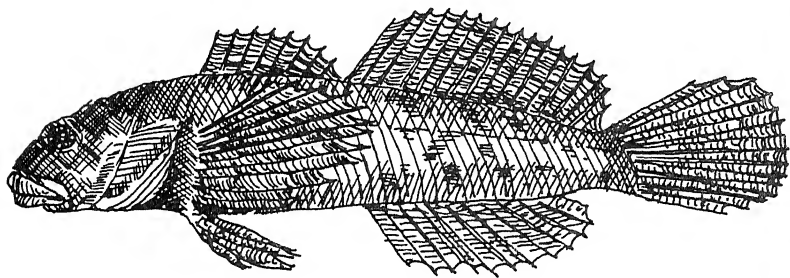
*Chinook Salmon* - \*(All salmon have more than 12 rays in the anal fin -- all trout have less than 12.) Back is dark olive, shading to light brown on sides; irregular black spots on back dorsal fin and tail; adult fish are usually larger than 18 inches and have well-developed teeth. They are native to this area.



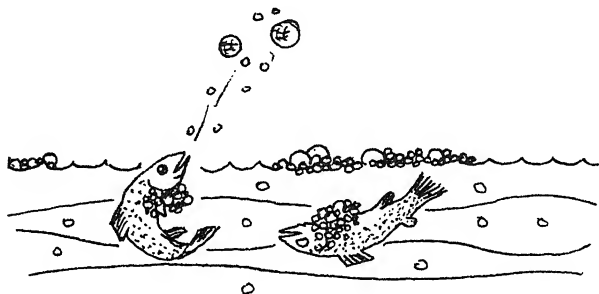
*Mountain Whitefish* - Back greyish blue to silver on sides, dull white on belly; no black markings; very small mouth without teeth. They are native to this rea.



Mountain Sucker - Back dark grey-green shading to white below; fine black spots on back and sides. Breeding males have orange and dark green stripes along sides. Adults are 4 to 7 inches long. They are native to this area.



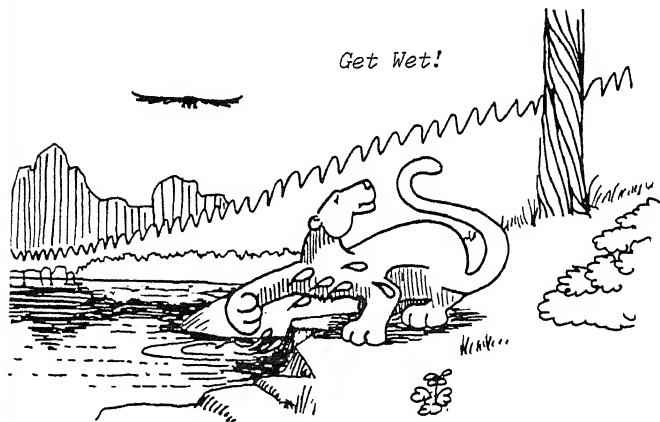
Sculpin - A small dark colored fish with large head and eyes, with wing-like fins. Coloration is dark and mottled. Usually found in the riffles of cold streams. Adults are 2 to 4 inches long. They are native to this area.

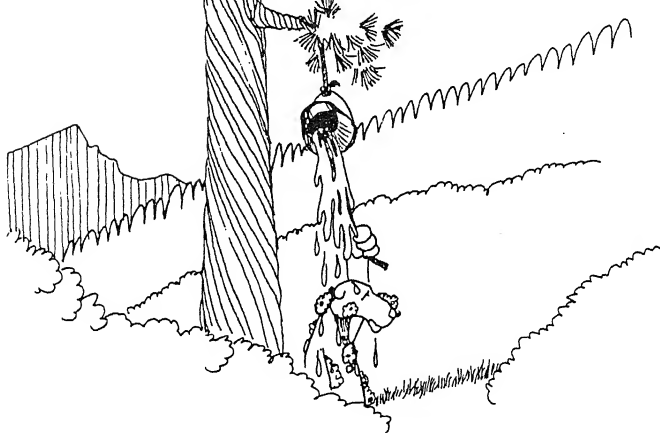


## NO-TRACE CAMPING

### LESSON #3: SOAP

Fish and soapy water do not mix. Please wash your dishes on shore in a pot of water and then dump the water on the ground far from a lake or stream. You can take baths without polluting as well.





*Soap up and rinse off on shore with pots of water. The soapy water will percolate through the soil and purify itself.*

## THE PLACE NAME GLOSSARY

**Archer Mt.:** George Archer was a trapper who skied off a cliff during a blizzard in January 1909, while running his trap lines. A small boy picking huckleberries with his mother found his body the next summer.

**Army Mule Saddle:** Near here, a string of army mules enroute to the Bald Mt. fire of 1929 tumbled off the trail killing one mule.

**Bailey Mt.:** Robert Bailey was a Forest Service employee in 1910.

**Bass Creek and Lake:** D.C. Bass settled on the creek in 1864. He built the first irrigation ditch in Montana and operated one of the first two sawmills in the State. Bass Lake was dammed in 1898.

**Bear Mt.:** Originally Beargrass Mt. The name was changed in 1924 because another National Forest had a mountain with the same name.



Bearwallow Lookout: According to the Nez Perce Indians, bears wallowed in a small pond near this point. The pond has disappeared.

Beaver Jack Mt.: Named after an early prospector and trapper who was also one of the first timber sale permittees on the Bitterroot National Forest. He whip-sawed logs into lumber to make sluice boxes for mining.

Bitterroot National Forest, River and Mountains: The Bitterroot is a flower named by Lewis and Clark, and was a source of food for Indian tribes.

Blodgett Lake, Mt., Pass, and Creek: Joseph Blodgett settled on this creek in the late 1800's. Originally named George Red Crow Creek after an Indian.

Boyd Lake: Robert Boyd was a trapper who poached marten in the area.

Chaffin Creek: John S. Chaffin homesteaded at the creek's mouth in the 1880's.

Como Lake and Peaks: Father Ravalli, one of the first Jesuit Priests in Montana, named the lake after Lake Como in his native country, Italy.

Cooperation Creek: Until 1934, this stream formed the boundary between the Powell and Lochsa Ranger Districts. The name commemorates the close cooperation between the two districts in controlling forest fires.

Cox Creek: Cox was an early homsteader on the Selway River.

Crew Creek: James Crew homesteaded the mouth of this creek in 1916.

Dollar Lake and Creek: Local residents felt that the lake looked round as a dollar when viewed from the ridge above.

Dolph Creek: Adolph Weholt was an early forest ranger stationed at Elk Summit.

Downing Mt.: George and Albert Downing homesteaded in the area in 1881.

El Capitan: Spanish for "the captain." Originally called Gunsight Peak because from the east the peak forms a V.

Elizabeth Lake: Elizabeth MacGregor was the wife of an early forest ranger.

Fay Creek: Fay Smith homesteaded at the mouth of this creek.

Fenn Mt.: In the 1920's, Major Fenn was the Supervisor of the now disbanded Selway National Forest.

Fitting Creek: In 1900, Lew Fitting was the first Forest Service employee stationed in the Moose Creek area.

Fox Park and Point: Charley Fox worked as the Maple Lake Lookout in the early 1920's.

Freeman Peak: Frank Freeman was hired by the Forest Service in 1908. He established the first lookout on the peak. Later, in 1919, he homesteaded in East Moose Creek.

Fred Burr Creek and Lake: Burr settled in the Bitterroot Valley in 1856. He spent time working as an engineer with the Mullan survey party, one of the first in western Montana. At one time, he had been a horse and cattle trader for travelers on the Oregon Trail.

Freezeout Saddle: Two Forest Service employees, Ralph Hand and Fred Madison, were camped in the saddle in the fall of 1929. Their horses ran off. Caught in a blizzard, they hiked through snow six feet deep before reaching the Lochsa River.

Friday Pass: Named after Lloyd Fenn, who in 1917 was on a survey crew in the area. The crew nicknamed him "Man Friday."

Gash Creek and Point: Jim Gash settled on the creek in 1873.

Ghost Mt.: The divide between the Selway and Lochsa Rivers was a Nez Perce hunting trail. Several Indian names and legends are part of this area. Ghost Mt. commemorates a spirit that the Nez Perce believe lives near here.

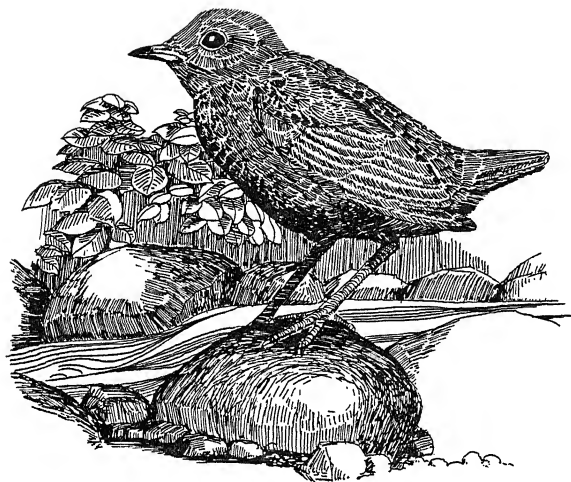
Grave Meadows: A small girl died in these meadows during a fishing expedition with her family (the Parsons) to the Salmon Hole.

Grave Peak: Isaac Hill's grave is near here (See Isaac Creek).

Isaac Creek and Lake: Isaac Hill, a Nez Perce Indian, claimed that he found gold in this creek in 1880. He died in 1887 trying to lead Jerry Johnson to his strike. His last words as he pointed to the southeast were "plenty gold three sleeps away." Prospectors ever since have tried without success to find his strike.

Indian Creek: Named for Indian Blake who supposedly mined for gold on this creek. The location of the mine remains a mystery.

Jesse Pass: The pass was discovered by Jesse Spotted Eagle, a Nez Perce scout.



WATER OUZEL

- \* Found along streams.
- \* Bobs up and down on rocks.
- \* Can dive, swim underwater, and walk on the bottom of a swift stream while searching for insects and small fish.

Koch Mt.: Elers Koch was a former Supervisor of the Bitterroot National Forest.

Kooskooskia Meadows: The Nez Perce word for Clearwater. This was their name for the Lochsa River.

Kootenai Creek and Lake: The Kootenai are a tribe of Indians in Northern Idaho, Montana and British Columbia.

Legend Lake: According to Nez Perce legend, a brave and two squaws were snowbound in the Crags and spent the winter on the shores of this lake. The lake is near the Nez Perce hunting trail to Montana.

Lochsa River: The Snake-Sioux word for rough water.

Lolo Creek, National Forest, and Peak: There is confusion over the origin of the word Lolo. Lolo was probably a French trapper named Lawrence who lived in Montana around 1810. Because the Flathead and Nez Perce languages do not have the letter "n", the Indians pronounced his name "Lou-Lou", which map makers corrupted to "Lolo". Lawrence wounded a grizzly which then charged and mauled him. He died from his injuries. The Flathead name for the creek was Tum Sum Lech, meaning "no salmon." Lewis and Clark called it Traveler's Rest.

Lost Horse Creek and Pass: A party of prospectors in 1881 crossed the creek in high water, drowning one of their horses. Captain Clark of the Lewis and Clark expedition also had trouble crossing this stream.

Lottie Lake: Daughter of William Perry, a homesteader at Lowell.

Maude Lake: Wife of William Perry, a homesteader at Lowell.

Mocus Pt.: Indian word for lonesomeness for female companionship.

Mt. George: Ben George was a trapper and early Forest Service employee.

Nelson Creek and Lake: Jack Nelson, a blacksmith, had a timber claim near the mouth of the creek in 1896.

Nezperce National Forest: Named after the Nez Perce Indian tribe. Translated, these French words mean pierced nose. This, however, has never been a tribal practice.

Oldman Creek and Lake: When following the Nez Perce hunting trail to the east, the women, children, and old men would camp at the lake while the young men continued on into the rugged terrain of the Craggs. (See Ghost Mt.).

Parson's Lake and Spring: Some confusion over which Parsons is commemorated by these landmarks -- probably Billy Parsons, who was a packer based at Selway Falls cabin.

Pettibone Creek and Ridge: Henry Pettibone homesteaded what is now Selway Lodge in the early 1900's. His grave is on the property. Formerly called Indian Creek and Ridge.

Pinchot Creek: Gifford Pinchot was the first Chief of the Forest Service.

Printz Mt.: Fred Printz was a guide and packer who at one time operated a sawmill in the area.

Renshaw Creek: Named after an early homesteader on the Selway.

Rhoda Creek: Major Fenn, Supervisor of the former Selway National Forest, named this creek after his daughter. During a pack trip with her father, she had commented that it was beautiful.

Running Creek: In 1898, Tom Running was the original homesteader at the mouth of this creek. He went blind in 1904 and gave up his claim.

Savage Ridge: Milton Savage was an early trapper.

Schwar Creek: Joe Schwar was an early trapper.

Selway River: A combination of words from the Nez Perce and Snake Indian languages meaning smooth water or good canoeing.

Sheafman Creek: Sometimes spelled Schiffman. He was a settler around 1870.

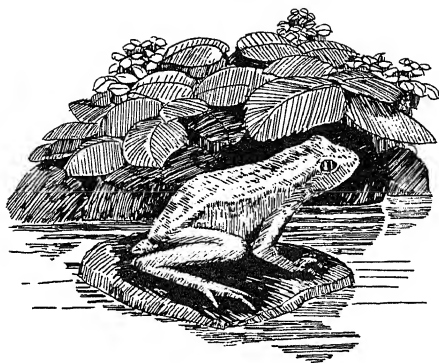
Shattuck Mt.: Professor Shattuck from Washington State College traveled through this area in 1910.

Sheephead Creek: Named for the mountain sheep in the area.

Shissler Peak: Two brothers, Fred and George Shissler, homesteaded on North Moose Creek in 1903.

Sixty-Two Ridge: In 1900 a Forest Service employee found this date carved on a tree on the ridge.

Soda Springs Creek: There is a small soda springs two miles up the creek from its mouth.



### TAILED FROG

- \* *The most primitive of the American frogs.*
- \* *Only two inches long.*
- \* *Found only in the northwest in cold, swift mountain streams.*
- \* *The only species of frog where the male fertilizes the female's eggs internally.*
- \* *Nocturnal and spends almost all of its time in the water.*



Stanley Butte and Hot Springs: Martin Stanley trapped this area. He disappeared, and later a human skull was found near the butte.

St. Mary Peak: Originally named St. Mary's Peak on September 24, 1841 by Father Pierre -- Jean De Smet, a Jesuit Priest. In 1965 the Knights of Columbus began an annual pilgrimage to the peak. A shrine has been built near the summit.

Stuart Hot Springs: James Stewart was a Forest Service surveyor. Map-makers misspelled his name.

Sweathouse Creek: The Flathead Indians built special lodges over the hot springs along this creek. They used these structures as a type of sauna for relaxation.

Sweeney Creek, Lake and Peak: J. L. Sweeney came to Montana in 1864 and homesteaded on this creek.

Three Links Creek: In 1890, three large links were found carved in a tree. The Nez Perce called it Warm Springs Creek.

Tin Cup Creek and Lake: In the 1880's, George Sollemder kept a tin drinking cup for travelers where the road crossed the creek.

Tony Creek and Point: Tony was a trapper with a cabin at the creek's mouth. In the winter of 1905, he died alone in his cabin. The Forest Service found his remains in the spring.

Trapper Creek, Lake and Peak: A favorite area for fur trappers.

Twin Buttes: Originally called Squaw Tits.  
Official geographers did not approve and  
changed the name.

Vance Mountain and Point: James D. Vance was an  
early Forest Ranger on the Bitterroot  
National Forest.

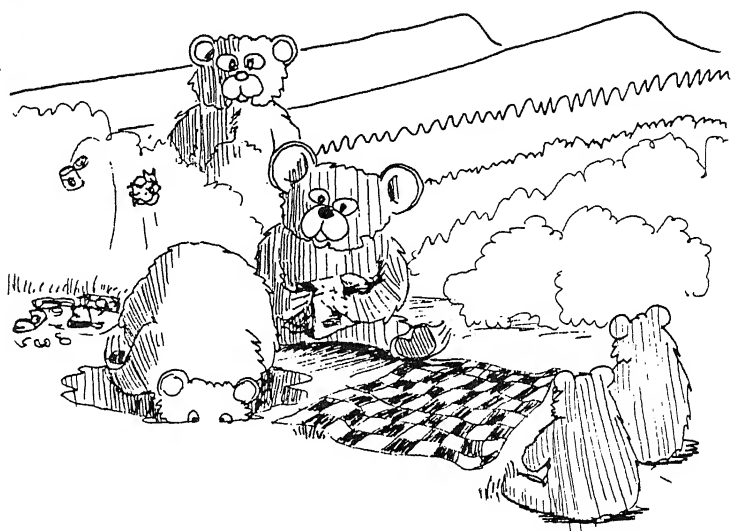
Wahoo Peak and Creek: An Indian slang word for  
wrong.

Watchtower Creek: To some, the peak at the head  
of the creek is shaped like a fire lookout.

White Cap Creek and Lakes: Named for the creek's  
white capped waves.

Whites Mt. and White Lake: Wilfred White was an  
early Forest Supervisor on the Bitterroot  
National Forest.

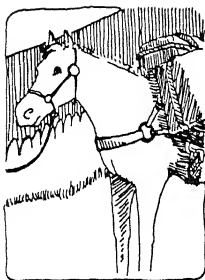
Wyllies Peak: William Wylie was a trapper who  
built a cabin near the peak and trapped the  
area in 1898 and 1899.



## NO-TRACE CAMPING

### LESSON #4: GARBAGE

- \* Paper and plastic will burn in a campfire. Aluminum cans and foil will not. They break up into small pieces that become litter.
- \* Cigarette butts, pull tabs, and candy bar wrappers are litter. Too many of these can be seen along the trails of the Selway-Bitterroot.
- \* Pack out your trash instead of burying it. The bears dig up garbage pits and scatter the trash.



### *Chapter III* *The Wilderness* *Horseman's Guide*

#### **A HORSEMAN'S THOUGHTS ON STOCK IN THE WILDERNESS**

By

Red Helton, Independent Horseman  
Moscow, Idaho

Backpackers are not fond of stepping around "pasture muffins" and hence, have no great love for the horsemen. Any horseman who, after many hours in the saddle, sleepily rounds a bend in the trail only to find himself scratching leather because a backpacker's dog has leaped yapping from the bushes has to work at being friendly toward the footsoldier. The point is, the basic problem is seldom the equipment a mountain visitor selects but the manner in which he uses it.

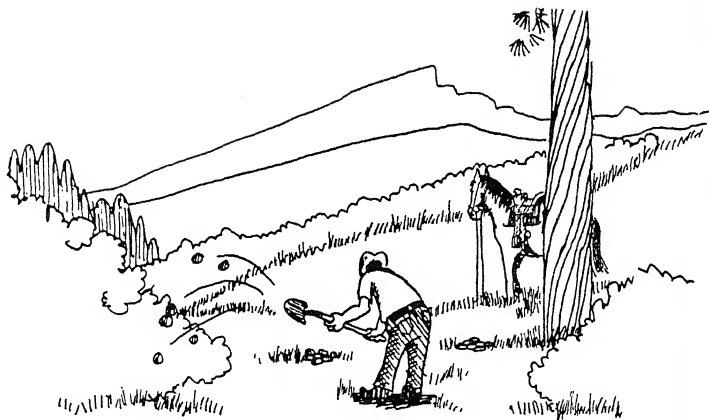
As an "independent" horseman who has spent a good bit of the last twenty years in the Selway-Bitterroot Wilderness, I definitely have my pet peeves. And the most worrisome of them is the actions of some horse people that call down the wrath of others on all of us. Even the most

concerned among us can't do much about the pasture muffins in the trail (horse diapers aren't practical), but we can keep them off the sandy beaches and choice tent and sleeping bag spots. And we can tether our stock far enough away from springs and creeks so that others will not have to worry about whether the water has been polluted.

One of the things that brings harshest criticism down on our heads is the lazy or thoughtless person who tethers his horse or mule up short to a live tree. Most animals get antsy with inactivity, and it only takes a few minutes for one to chew the bark off the tree or paw the soil away from its base exposing the roots. The result is a dying tree standing in a hole. The tree is no longer a bit of the nature that we came to enjoy but an ugly blemish that evokes disgust. There is just no justification for that sort of thing short of an emergency and they are few and temporary.

I don't think kind thoughts about fellow-horsemen when I come upon leftover corrals, fences, stove mounds and fire rings, piles of tent poles, or abandoned platforms and manger structures either. With good tethering techniques and modern lightweight camping gear, I see no reason for such landscape massacre anywhere, not even by the professional packer.

Packing hay is mostly the mistake of the beginner. There are many horse concentrate feeds on the market now, that are better and more convenient and they can be bought nearly anywhere. I prefer the alfalfa brick or pellet. They usually come in 50-pound bags, and two of those mantied on each side of a horse or mule make a very trailworthy pack that can provide up to 16 horse-days of complete ration including vitamins, salt, roughage, and protein. You don't need anything else for livestock but water.

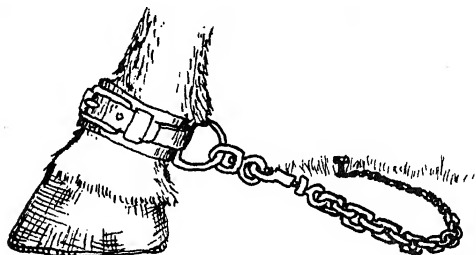
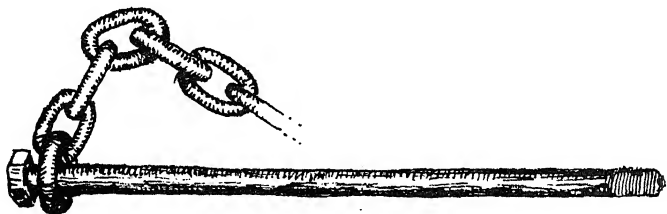


*"We can't do much about the pasture muffins,  
so scatter them..."*

Some horse people tend to carry all kinds of stuff into the backcountry that they don't need. I haven't met very many people as eager to pack out the resulting trash (ALL of it) as they were to haul the stuff in there in the first place. I don't mind kicking a few pasture muffins out of the way, but I get pretty hostile when I have to gather up someone else's garbage before I can roll out my sleeping bag. Leaving a clean horse camp requires a little effort but (except for those who have to depart hurriedly because of a snow storm or injury) I see no good excuse for not investing the time to do it. We can't do much about the pasture muffins, except scatter them to minimize the esthetic effect, but we at least ought to pick up everything we brought and take it out -- NOT bury it for animals to dig up and scatter later.

Like everything else in human affairs, most of the user conflict in our wilderness country could be eliminated with a little simple courtesy and thoughtfulness on the part of everyone, livestock people included.

*Red*

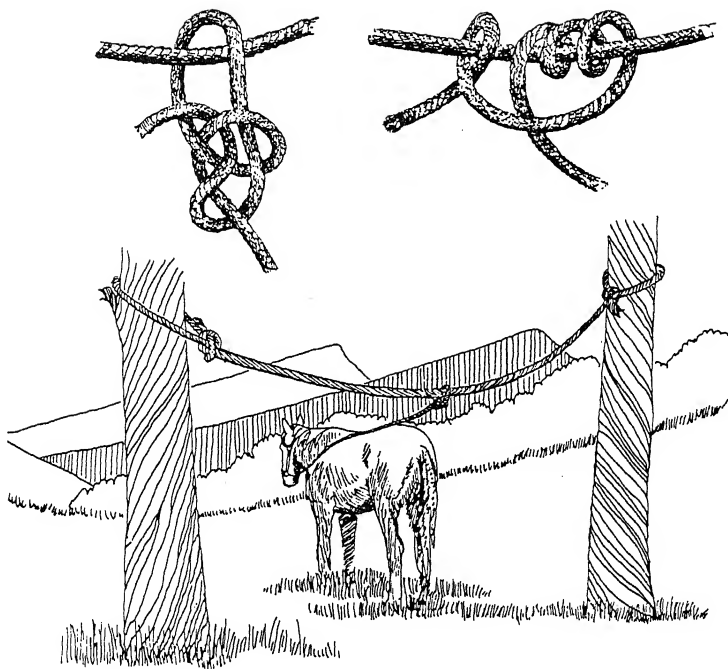


## STOCK HOLDING TECHNIQUES ILLUSTRATED

*To protect the trees of the wilderness, experienced Selway-Bitterroot packers use the following techniques:*

### *The Picket*

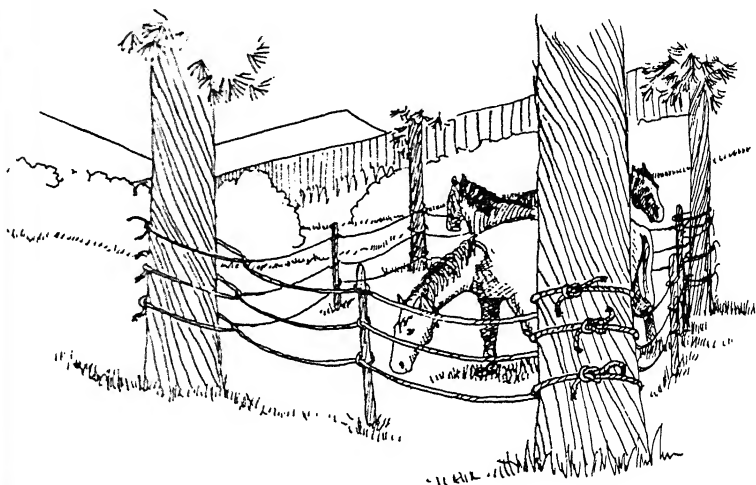
- 1. Buckle a single foot hobble (the kind with a chain) to your animal.*
- 2. Hook the chain over a stake or bolt planted firmly into the ground.*
- 3. Remember to move the stake often enough to prevent your animal from overgrazing any one spot. A good guide is to graze no more than 25% of the eatable forage.*



### *The Highline*

1. Stretch a rope tightly between two trees above your animal's head.
2. Tie his halter rope to the line, but leave just enough rope for his head to reach the ground to feed. Too much rope, and you could find an upside down bundle of horseflesh tied up in half hitches in the morning.
3. Use one of the two knots illustrated. The bowline lets your horse move up and down the line. The other knot holds him stationary so you can tie more than one animal to the same line.





### *The Rope Corral*

1. Form a corral by tying three one-quarter inch ropes, one above the other, to trees every 20 to 30 feet.
2. By running short tie ropes from the trees to each of the three corral ropes, you can tighten up the corral if it becomes loose.
3. About every 10 feet, tie on a stick or rope stay at right angles to the corral ropes to hold these ropes together. The stays will prevent a well-fed horse or mule from scrambling through.

## The Electric Fence

### Materials:

- \* Charger - 10 lbs.
- \* 6-Volt Battery - 9 lbs.
- \* 1320 foot reel (doesn't have to be this long) of 12 or 14 gauge aluminum wire - 23 lbs.
- \* Insulators (not the nail or screw kind that damages trees) - a few ounces each.
- \* Flagging

### Procedures:

1. Rope the insulators to trees or posts about three and one half feet above the ground. Make sure that the insulators face the inside of the corral. This keeps the wire from touching the trees and grounding out.
2. Run the wire through the insulators.
3. To make a gate, form a hook with the end of the wire and use some rubber for a handhold.
4. Hook up the battery and charger.
5. If your animals do not notice the wire at first, tie on some flagging. Be sure your horses are familiar with electric fences before entering the wilderness.

# THE PACKING IN FEED CHART

THE PACKING IN FEED CHART				
NUTRITION	BULK	BENEFITS FOR YOU AND YOUR STOCK	BENEFITS FOR THE WILDERNESS	PROBLEMS
BALED ALFALFA	Supplemented with oats, alfalfa provides all the nutrition and roughage stock needs.	1 bale is 60-90 pounds & measures 3'x18"x18".	1. Prevents damage from overgrazing. 2. Alfalfa bales are generally free of seeds and weeds.	1. Bulky to pack 1/2 bale (31 lbs) and 2. Stock waste some. animal per day.
	1. Supplemented with oats, cubes provide all the nutrients and roughage stock need. 2. 50% protein. 3. Water is the only additive. 4. Keeps 3 yrs.	Cubes are 6" long rectangles & take up 1/2 the space of the same weight of baled hay.	1. Prevents damage from overgrazing. 2. Cubes are generally free of seeds and weeds. This prevents non-native plants from invading the wilderness.	1. More expensive 15 lbs of cubes per than baled alfalfa, however, less 5 lbs of oats per scattered on the day per animal. ground and wasted. 2. Supply sources are limited.
COMPLETE HORSE RATION PELLETS	1. Eliminate internal parasites before using pellets. 2. Provides all the nutrients stock needs. 3. Some horsemen complain that pellets do not provide enough roughage.	1/3-1/4 the space of the same weight of baled hay.	1. Prevents damage from overgrazing. 2. Can be fed from nose bags preventing unsightly messes at the feeding area. 3. Pellets are digested more completely than hay or grass and less manure is passed. 5. Pellets have little dust.	1. Stock need to be gradually introduced to pellets before leaving home. 2. Some complain that horses chew on wood. 3. Costs more than baled alfalfa, but stock waste less.

## **IS PACKING FEED A HASSLE FOR YOU?**

Three reasons to go to the extra trouble anyway:

1. Most of the Selway-Bitterroot Wilderness is brushy or heavily timbered, and there are few good grazing areas. By carrying your own feed, you can find more places to camp.
2. The small areas where forage is available are easily overgrazed, resulting in erosion and invasion of weeds.
3. Sometimes, as a last resort, we have regulations to protect the beauty of the mountains for the generation of packers still growing up. As a result, grazing is not allowed in some meadows and on some lakeshores of the Selway-Bitterroot.

## **SALT**

When you place salt directly on the ground, it leaches into the soil, killing plants and creating artificial salt licks. You can protect the plants by using block instead of loose salt. Place the block on a rock or log or in some type of container. Don't forget to pack it out when you leave.

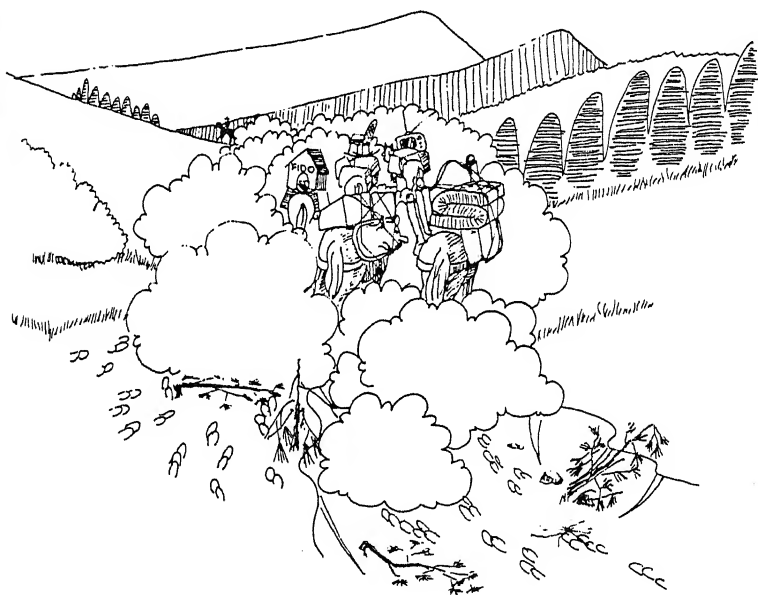
## **THE ECONOMY STRING**

You can reduce the number of your stock, save money, and protect the mountains by...

- \* Packing freeze dried foods instead of heavy can goods.
- \* Removing ketchup, pickles, coffee, etc. from their jars and placing them in plastic containers.

- \* Sleeping on foam pads instead of heavy cots.
- \* Cooking on lightweight collapsible stoves.
- \* Packing nylon tents with aluminum poles.
- \* Feeding pellets instead of bales of hay.

## THE RICH MAN'S STRING



The Rich Man's String: A good way to pack -- if your wallet is a bottomless pannier and you care nothing for the land.



## *Chapter IV* *The Sleeping Bag* *Story Book*

### **THE FOUNDING FATHER OF THE SELWAY-BITTERROOT**

He was raised in wealth in New York City, had a weak heart and died when he was only 38. He lived in the 1920's and 30's when most people couldn't have cared less about wilderness. And yet this man became America's leading crusader for wilderness, the individual most responsible for preserving the Selway-Bitterroot, and one of the first backpackers. He often hiked 30 to 70 miles a day in tennis shoes. In his short life, Bob Marshall accomplished more than a dozen less energetic people who live to be eighty. This city-raised millionaire climbed the 46 major peaks of the Adirondacks, embarked on over 250 wilderness expeditions, explored unknown reaches of Alaska's Brooks Range, wrote a bestseller on Eskimos, became an influential official of the Forest Service, founded the Wilderness Society, and established a nation wide system of wilderness areas.

Bob Marshall had a message for the American people and he was never too shy to share it. If roads continued to invade the nation's last wild places, "it will be only a few years until the last escape from society will be barricaded. If that day arrives, there will be countless souls

born to live in strangulation, countless human beings who will be crushed under the artificial ediface raised by man." When asked how much wilderness the country needed, he replied, "How many Brahms' symphonies do we need?"

These arguments impressed Forest Service Chief Silcox and in the mid 1930's the agency protected 5,400,000 acres of National Forests from roads and logging. These acres included the Selway-Bitterroot country Marshall knew personally and wouldn't forget. A grizzly had once chased him up a tree in these mountains.

Unsatisfied with these accomplishments, in 1939 a few months before he died, Marshall achieved his greatest triumph. He convinced Silcox to establish the "U" regulations which created National Forest wilderness areas throughout America that eventually totaled 14 million acres. When Congress passed the Wilderness Act in 1984, these acres became the foundation of today's National Wilderness Preservation System.

An exhausting hike in the North Cascades was too much for Marshall's heart. He died two months later on a train. The only individual to benefit personally from Marshall's will was the old Adirondack guide who had led him on his first wilderness trips. The rest of his fortune went to his favorite causes including wilderness preservation.

## THE RIDGERUNNER

He lived in constant fear, convinced all his life that someone was chasing him. For 24 years (1936 - 1960), the ridgerunner fled through the mountains in and around the Selway-Bitterroot, pursued by his imaginary enemies. He hid from everyone, shot at low flying airplanes, and always kept moving. Not even winter and lack of snowshoes stopped his ridgerunning. For warmth, he wore a shirt made from a blanket and socks from dish towels. For food, he broke into backcountry cabins with a key made from the tin of a meat can braced with the broken blade of a jack-knife. To avoid capture he seldom slept in cabins. His shelter even in blizzards was a torn piece of canvas.

Although few had ever seen him, there was no doubt he existed. His unique way of ruining every cabin he visited was his calling card. Opening cans and jars (he especially loved jam), he would eat a little from each container and then leave the covers off so everything would spoil. Instead of removing the outside cap on the stovepipe, he would dismantle the pipe inside and smoke would fill the room, blackening the walls. He dirtied every dish and scattered garbage on the furniture and floor. His fame grew in Central Idaho.

In 1942 rumors spread that the ridgerunner was Baldy Webber, a vicious criminal wanted for attempted murder. By raiding a trail crew camp, he finally pushed the Forest Service too far and they resolved to capture him. But even real enemies couldn't catch the ridgerunner. For three years the Forest Service chased him through the Selway country. He raided a trail maintenance camp on Rhoda Creek. Once when his pursuers were too close, he hid in a hollow tree on Roundtop Mountain. Finally, in February, 1945, after following his tracks in the snow for

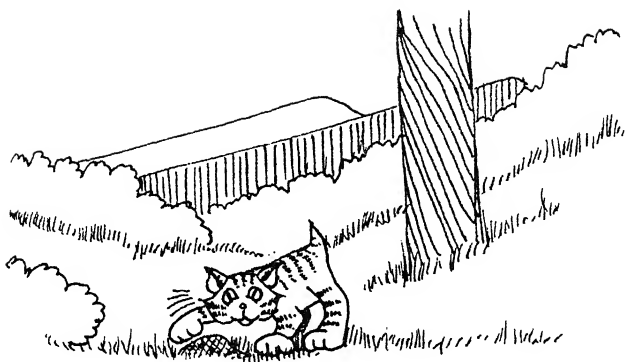


miles, the Clearwater National Forest's two best woodsmen, Moton Roark and Lee Horner, spotted smoke from his campfire. Knowing Webber to be dangerous, they armed themselves, separated, and moved towards the camp from two directions. Quietly, they crept closer. When they could almost touch him, the Ridgerunner glimpsed Roark's snowshoe. Roark ordered, "Don't move."

But huddled by the campfire was not Webber, the killer. The ridgerunner was Bill Moreland, a tiny 5'2" man wearing rags and missing most of his teeth.

Nothing ever stopped Moreland - not even arrest. The judge liked him and after serving only 90 days in an Orofino jail, he rushed back to running ridges and messing up cabins. Eventually he acquired another bad habit. He shot at real people. Exasperated, the Forest Service recaptured him in 1958 by outrunning him with a helicopter. This time the courts committed him to the mental hospital in Orofino, but to no avail. He escaped in a year.

Only when he was too old to run did Moreland leave the mountains. In 1960, he voluntarily returned to the hospital retiring from ridge-running forever.



## **NO-TRACE CAMPING**

### **LESSON #5: BURYING YOUR HUMAN WASTES**

- \* With the heel of your boot, a shovel, or a trowel, dig a hole five or six inches into the humus layer at least 100 feet from water.
- \* Afterwards, cover the hole and micro-organisms will decompose the wastes.
- \* If you are in a large group, dig a long, but shallow, latrine. Remember to fill it in before you leave.

## THE LOST ROSENCRANS PLANE

Late Afternoon, October 24, 1948

Damn! Not another storm coming! How was he going to fly to Lewiston in this kind of weather? The generator at his private dude ranch in the heart of the Selway-Bitterroot had broken down. His wealthy guests were complaining. As a multi-millionaire businessman, Joe Rosencrans was not accustomed to waiting for the things he needed. He just had to have those new parts. Located at the confluence of the East and North Forks of Moose Creek, Moose Creek Ranches with its lodge and gambling tables was an interesting hobby, but it sure was a long way from town when you couldn't fly. The instruments in his Stinson aircraft weren't working right now. Even though he was an experienced pilot, there was no way he could keep from nose diving into a mountain if he couldn't see through the rain and fog. But maybe, just maybe, he could sneak underneath the clouds down the Selway River Canyon and then follow the Clearwater to Lewiston.

He heard a plane take off from Moose Creek Ranger Station a few miles away. So Bert Zimmerly had the same idea. Well, if the president of Lewiston's Empire Airlines thought he could make it, then it must be okay. "Come on, Bolick, let's give it a try."

In fifteen minutes, Rosencrans and Wintsel Bolick, his electrician, were in the air. Rosencrans wore an expensive diamond ring and carried \$2,300 he had won at cards the night before.

Zimmerly made it to Lewiston - just barely. Rosencrans was fifteen minutes too late. A storm had moved across the mouth of the Selway and blocked his path. Pretty irritating, but no

real problem. He'd just turn around in the canyon, fly back to the airstrip at the Ranches, and try again the next day. But a second storm raged over Moose Creek. He couldn't land. Surely there was some place he could go, some way to get out of this canyon. Or was he trapped? Up and down the Selway he flew looking for an escape. The storms grew and his prison shrank. It was almost dark. Rain was everywhere. The fog thickened. He couldn't see. The gas gauge read empty. An opening loomed ahead. Big Fog Saddle. Thank God.

Hunters camped in the Saddle reported that a plane roared by just missing their heads. The engine stalled, then caught fire again. Other hunters heard an explosion. A few saw fire on a distant hillside.

October 25 - 29

The next day, Del Cox, the dispatcher of the Selway-Middle Fork Ranger District, organized the most massive search and rescue in the history of the Selway-Bitterroot, before or since. From eye witnesses, he zeroed in on a small area. Sixty Forest Service men searched on the ground while dozens of planes crisscrossed the sky. Mrs. Rosencrans offered a \$5,000 reward. The Governor called up the National Guard. Everyone knew that they would at least find some wreckage.

October 30

Heavy snowfall. Cox called off the search until the weather improved. It never did. The worst snows in Central Idaho history fell that winter. Thousands of elk starved.

November 4

Rosencrans, still missing, was elected to the State Legislature.

December 3

Rosencrans was declared legally dead.

Late Fall, 1952

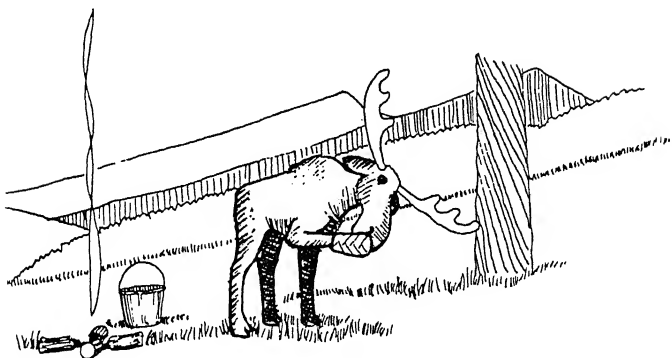
Zimmerly, against the advice of his friends, took off in a storm from Spokane. He crashed into a butte and died.

Today

People have never stopped looking for Joe Rosencrans. For some, it's an obsession. Nevertheless, no trace has ever been found of Rosencrans, his electrician, his plane, his money, or his ring. Some say Rosencrans deliberately disappeared and changed his identity. Some say there was \$100,000 on board and Bolick hi-jacked the plane to Mexico. Some say that rescuers found the plane, looted the corpses, and kept quiet. Del Cox laughs at these theories. "Oh, it's out there all right. It's probably on that hillside right in front of us. Men and planes are pretty small in a wilderness."

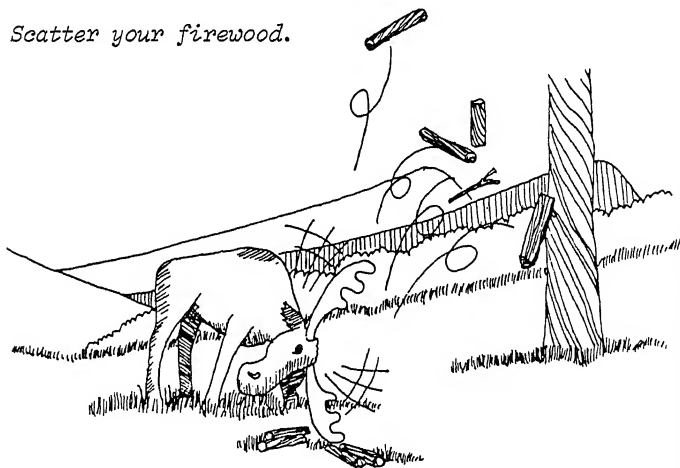
## NO-TRACE CAMPING

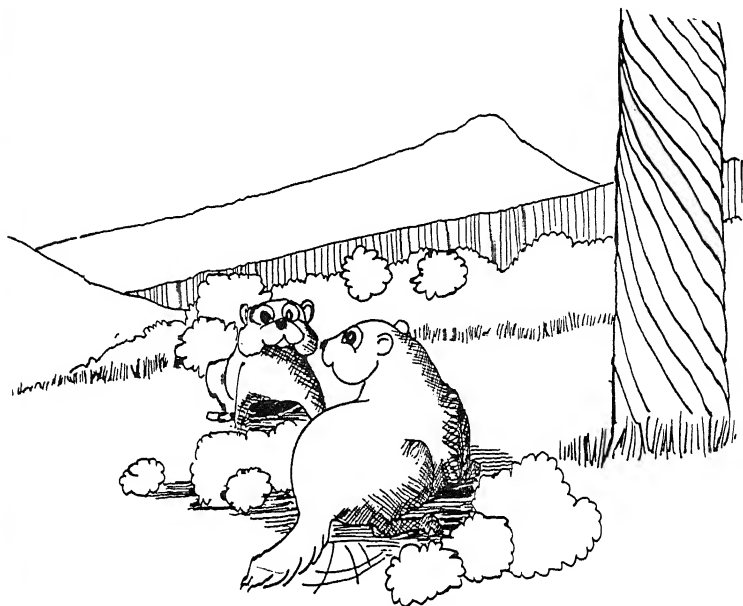
### LESSON #6: BREAKING CAMP



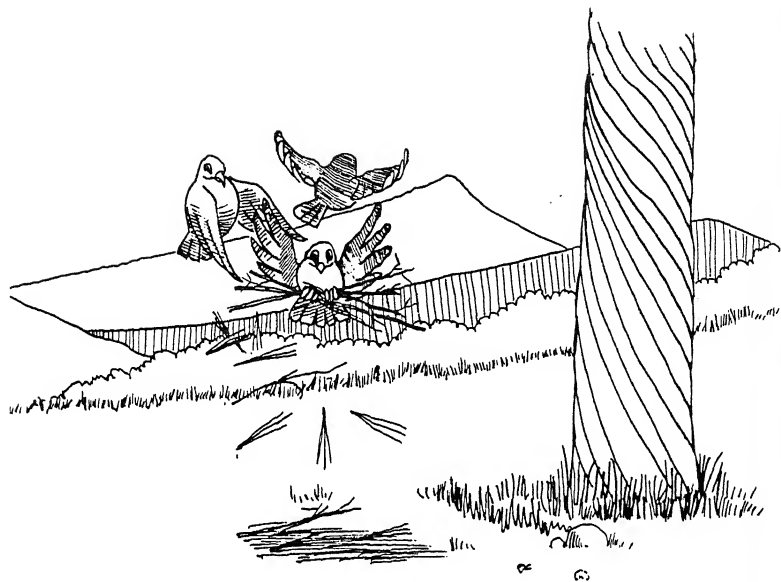
*Drown your campfire. Make sure it is out by feeling the ashes with your hand. If any ashes feel warm, use more water.*

*Scatter your firewood.*



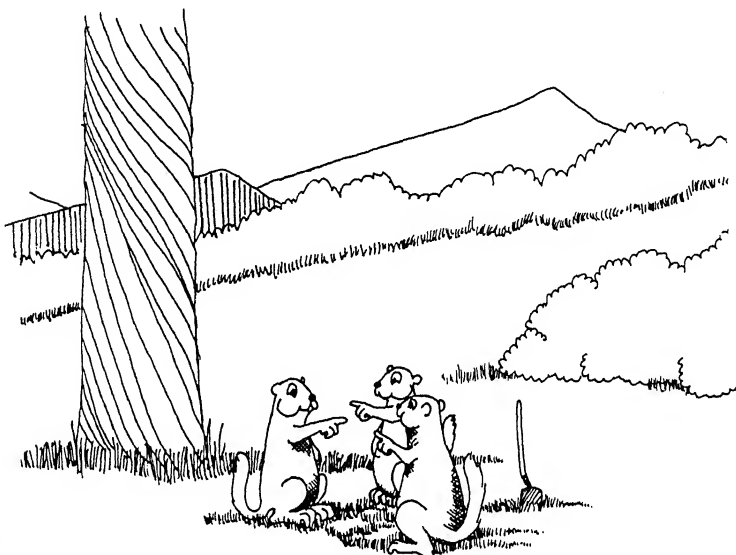


Scatter the cold ashes and any rock (remember you don't need to use rocks in the first place) away from the campsite where they can't be seen.

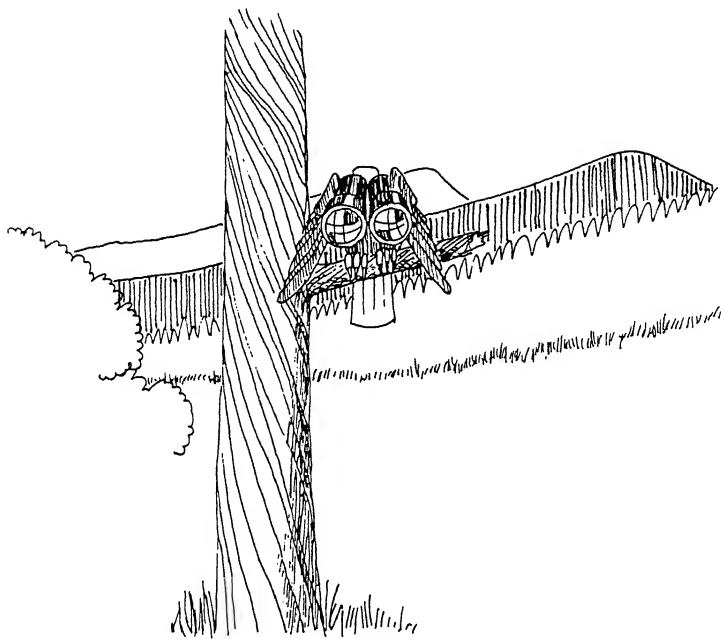


*Spread needles and twigs over the fire scar.*

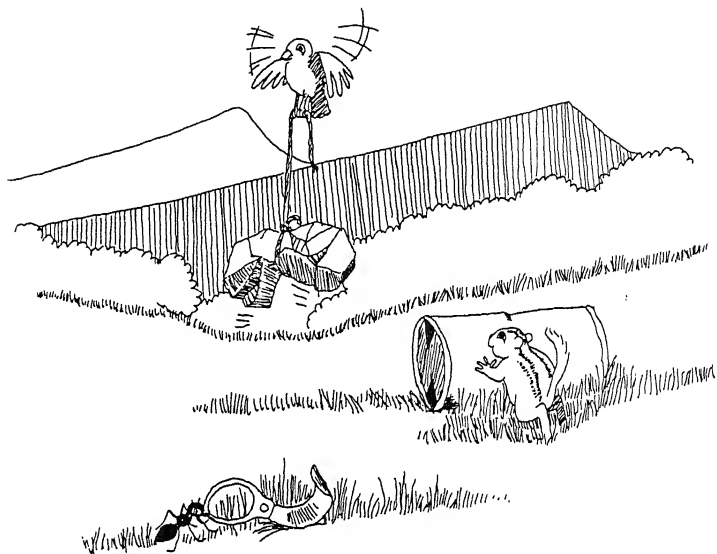




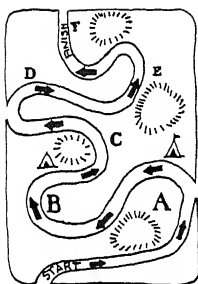
*Fill in the latrine (if your group had one).*



*Search for small bits of trash such as cigarette butts, candy bar wrappers, and pull tabs.*



*Pack out all garbage.*



## Chapter V The Alphabetical Trip Planner

### ACCESS

Snow and road conditions are not always predictable. For up to date information, call one of the Ranger Stations on page 74.

#### Access Roads

<u>Road Number</u>	<u>Dates Free of Snow</u>
US 12 (Lochsa Highway)	All Year
US 93 (Missoula to Salmon)	All Year
US 95 (North & South Highway)	All Year
Idaho 14 (Elk City Road)	All Year
FS* 91 (West Fork Road)	All Year
FS 222 (Elk City to Red River)	All Year
FS 223 (Selway River Road)	Apr. to Mid-Nov.
FS 285 (Elk Mt. Road)	Mid-Jul. to Mid-Oct.
FS 290 (Indian Hill Road)	Mid-Jul. to Mid-Oct.
FS 295 (Elk Summit Road)	Mid-Jul. to Mid-Oct.
FS 317 (Coolwater Road)	Mid-Jul. to Mid-Oct.
FS 319 (Fog Mt. Road)	Mid-Jul. to Mid-Oct.
FS 429 (Lost Horse Creek Road)	Mid-Jul. to Mid-Oct.
FS 468 from West Fork Ranger Station to Paradise	Jun. to Nov.
FS 468 from Red River Ranger Station to the Upper Selway River	Mid-Jul. to Mid-Oct.

\*FS = Forest Service Road

## ACCIDENTS

If possible, keep one member of the party with the victim. Find help at one of the information stations or Ranger Stations shown on the map on page ii . As a last resort, build a smokey signal fire.

## ADDRESSES

### Supervisor's Offices

Forest Supervisor  
Bitterroot National Forest  
Hamilton, Montana 59840  
Phone: 406/363-3131

Forest Supervisor  
Clearwater National Forest  
Orofino, Idaho 83544  
Phone 208/476-4541

Forest Supervisor  
Lolo National Forest  
Missoula, Montana 59801  
Phone: 406/329-3563

Forest Supervisor  
Nezperce National Forest  
Grangeville, Idaho 83530  
Phone: 208/983-1950

### Ranger Districts

District Ranger  
Darby Ranger Station  
Darby, Montana 59829  
Phone: 506/821-3236

District Ranger  
Stevensville Ranger Station  
Stevensville, Montana 59870  
Phone: 406/777-5461

District Ranger  
Lochsa Ranger Station  
Kooskia, Idaho 83539  
Phone: 208/926-4275

District Ranger  
West Fork Ranger Station  
Darby, Montana 59829  
Phone: 406/821-3269

District Ranger  
Missoula Ranger Station  
2801 Russell  
Missoula, Montana 59801  
Phone: 406/329-3111

District Ranger  
Moose Creek Ranger Station  
Grangeville, Idaho 83530  
Phone: 208/983-2712

District Ranger  
Powell Ranger Station  
Lolo, Montana 59847  
Phone: 208/942-3113

## PUBLIC AIRSTRIPS

Location	Length	Elevation	Radio Frequencies For Landing and Take Off	Hazards
Moose Creek Ranger Station	Two Runways 2100 + 4100 Feet Long	2400 feet	Use 122.9	<ol style="list-style-type: none"> <li>1. No unicom system</li> <li>2. Grass runway</li> <li>3. Narrow canyon</li> <li>4. Hot summer afternoons</li> <li>5. Heavy weekend traffic</li> <li>6. Runways soft in late Fall and Spring. Long runway may be closed.</li> </ol>
Shearer Guard Station	2000 Feet	2560 Feet	Use 122.9	<ol style="list-style-type: none"> <li>1. No unicom system</li> <li>2. Grass runway</li> <li>3. Narrow canyon</li> <li>4. Hot summer afternoons</li> </ol>
Fish Lake	3600 Feet	5600 Feet	Use 122.9	<ol style="list-style-type: none"> <li>1. No unicom system</li> <li>2. High elevation</li> <li>3. Grass runway</li> <li>4. Erratic air conditions over the lake</li> </ol>

## **FIRE**

Fire is a natural force - as much a part of the Selway Bitterroot Wilderness as are mountains or streams. In recognition of this, the Forest Service has developed a program which allows certain naturally caused fires to burn under predetermined conditions. These fires are technically referred to as "Prescription Fires," but are commonly called natural fires.

If a fire is burning in the wilderness you can get information about it from any Forest Service employee in the area.

Beware of the following hazards:

- Erratic fire behavior.
- Falling snags and trees.
- Rolling rocks and logs.

## **FISHING**

In streams and high mountain lakes.

Idaho and/or Montana State fishing licenses required.

See page 32 for species of fish found in the Selway-Bitterroot Wilderness and how to identify them.

For information on regulations and licenses contact the State Fish & Game Departments. See page 78 .

## FLOAT TRIPS

On the Selway River.

Floaters who boat without a commercial outfitter are required to draw for and obtain a permit from the West Fork Ranger Station, Darby, Montana. The District Ranger can also provide a list of commercial outfitters.

## GROUND TO AIR SIGNALS

If you need help and cannot travel, you can signal an airplane or helicopter using these FAA Visual Emergency Signals. Construct the signals in an open area using whatever materials are available such as rocks, clothes, flagging, sleeping bags, etc.

Require Doctor, Serious Injury	—
Unable to Proceed	X
All Well	L L
No	N
Yes	Y
Not Understood	J L
Help Urgently Needed	S O S
Require Food and Water	F

If a pilot has received your message, he will rock his plane. If he plans to drop you a message, he will gun his motor three times.



## HUNTING

General hunting seasons for elk, deer, bear, cougar, grouse.

Permit hunts for moose, mountain goat, bighorn sheep.

Idaho and/or Montana State hunting licenses and tags required.

For information on regulations, licenses, and tags contact the State Fish & Game Departments.

## INFORMATION

Found at Ranger Stations, Supervisors' Offices, and at the Wilderness Information Stations at major trailheads. See map on page ii.

Wilderness information specialists provide up-to-date information on trail conditions, regulations, natural history, and where to find facilities. Maps and free garbage sacks are available. You're always welcome to stop by for a rest and a cup of coffee.

### Wild and Fishing Information and Regulations

Idaho Fish & Game Department

1000 N. 1st St.  
Boise, Idaho 83724

Montana Fish & Game Department

1000 N. 1st St.  
Helena, Montana 59601

### Outfitters & Guides

Idaho Outfitters & Guides Association  
P.O. Box 95  
Boise, Idaho 83701

Supervisor of Outfitting  
Montana Department of Fish & Game  
1420 East 6th Avenue  
Helena, Montana 59601

### Topographical Maps

U.S. Geological Survey  
Denver Federal Building  
Building 41  
Denver, Colorado 80255

## **MAPS**

Forest Service maps are available at Supervisor's Offices, Ranger Stations and Wilderness Information Stations. Ranger District maps are free. Full wilderness maps are for sale.

For topographical maps write to the U.S. Geological Survey at least two months in advance.

A diagram showing locations and names of topographical quadrangles pertaining to the Selway-Bitterroot Wilderness is located inside the back cover.

## OUTFITTERS

Contact State Outfitter & Guide Associations for lists of outfitters that operate in the Selway-Bitterroot Wilderness. See previous page for addresses. These lists are also available at Ranger Stations.

## PERMITS

**HIKERS:** No permit is required if your party has no more than 20 people and you do not plan to stay longer than 14 days. If you need a permit contact one of the Ranger Districts listed on page 74 .

**Horsemen:** No permit is required if your party has no more than 20 people, no more than 20 stock, and you do not plan to stay longer than 14 days. If you plan to graze, a permit is required in some portions of the Wilderness. If you need information on grazing or a permit, contact one of the Ranger Districts listed on page 74 .

**Floaters:** A permit obtained from a special drawing is required to float the Wilderness portion of the Selway River from the mouth of White Cap Creek to the mouth of Race Creek. Contact the West Fork Ranger District. See page 74 for address.

## PRIVATE PROPERTY

There are a few residences on private land along the Selway River and Moose Creek. The owners value their solitude. Please respect their privacy.

## **SAFETY**

A wilderness area has many dangers and hardships. No one will be looking after you in the Selway-Bitterroot Wilderness. You must be prepared to take care of yourself.

### **Pests**

Stay alert for rattlesnakes. You may encounter mosquitoes, no-see-ums and horseflies. There is no known poison ivy or poison oak. Avoid sleeping under dead trees. They may topple over.

### **Lost**

Calm yourself. By traveling downhill, you eventually will reach the heavily traveled Selway, Lochsa, or Bitterroot River valleys. There often are Forest Service trails on major ridgetops.

### **Hypothermia**

Exposure to the wet and cold is one of the greatest dangers in the wilderness. Even when the temperature is above freezing, prolonged wetness can cause the body temperature to lower and result in death.

#### **The Symptoms:**

1. First, shivering and impaired mental and physical ability.

2. Next, irrational conduct and jerky muscle coordination.
3. Finally, unconsciousness and death.

### The Treatment

1. Remove the victim from the wind and rain.
2. Strip off clothes and dry victim off.
3. To raise body temperature, skin to skin contact inside a sleeping bag is an effective method. If possible, sandwich the victim between two people.

### Prevention

1. Have good rain gear including rain pants or chaps. Keep your sleeping bag dry at all costs. Some people place their bag inside a waterproof stuff sack and place the stuff sack inside a plastic garbage bag.
2. In wet weather wear materials such as wool that can keep you warm when it is wet. Don't forget to cover your head. More than half your heat can be lost when your head is exposed.
3. Use a tent, fly, or some other type of shelter.
4. Keep eating. In wet weather, some people feel too uncomfortable to eat, and fail to provide their body with the fuel it needs to produce heat. Sweets, proteins, fats, and carbohydrates can produce body heat rapidly.
5. Exercise and keep active. This is essential to keeping warm. Be careful, however, not to become exhausted.

## TOPOGRAPHY

Elevations range from 1800 feet on the Selway and Lochsa Rivers to 10,000 feet in the Bitterroot Mountains.

Many long ridges between 5,000 and 6,000 feet.

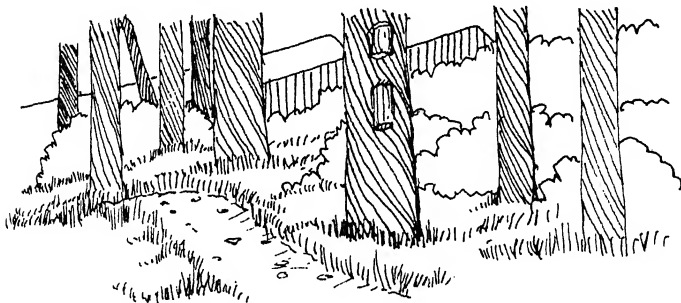
Many steep slopes.

All streams drain into the Selway, Lochsa, or Bitterroot Rivers.

## TRAILS

Although hundreds of miles of trails are maintained by the Forest Service each summer, some of the trails shown on the maps may not be passable at the time of your trip. Some trails are especially challenging or unsuitable for stock. Contact a Ranger Station or Wilderness Information Station for trail conditions.

Hikers meeting packstrings can avoid frightening the animals by getting as far away from the trail as possible, talking to each horse or mule as it passes, and making no sudden movements. Horses have the right-of-way over people on foot.



*Forest Service trails are marked with distinctive blazes.*

## WEATHER

The temperature usually drops as you climb in elevation.

Selway and Lochsa River Canyon bottoms: usually free of ground snowpack from April to November. There can be snow squalls in April, May, June, September, and October as well as during the winter months. Temperatures can reach 100° in the summer.

Above 5,000 feet: generally free of ground snow pack from July to Mid-October; however, there can be snow squalls any month of the year. Summer temperatures can change from warm to cold and back to warm again in the course of one day. Be prepared for rain.

## FINAL EXAM FOR THE NO-TRACE CAMPING SELF STUDY COURSE

1. Which one of the following is a poor location for a no-trace campsite?
  - a. Out of sight of the main trail
  - b. On a lake shore
  - c. In a well drained grove of trees
  - d. On a rocky flat between the boulders
  - e. In a spot used by previous campers
2. True or False. Always ring your campfire with rocks to keep it from spreading.
3. Circle which of the following animals need standing snags as part of their habitat.
  - a. Pine squirrels
  - b. Long tailed weasels
  - c. Great horned owl
  - d. Bluebirds
  - e. Silver haired bats
4. Which is the best method for rinsing soap off your body?
  - a. Swim in a lake
  - b. Jump into a swift-flowing stream
  - c. Pour pots of water over your head on shore
  - d. Roll in a snowbank
  - e. Wait for a downpour
5. True or False. The best way to dispose of empty instant soup and cocoa packets is to burn them in your campfire.
6. True or False. Garbage that will not burn should be buried.



7. How deep should you bury human wastes?
  - a. One foot
  - b. Over a foot
  - c. Leave on the surface
  - d. Five to six inches
  - e. One inch
8. Which is the best method for making sure that your campfire is out?
  - a. Look for smoke
  - b. Blow on it and see if any coals turn red
  - c. Listen for the sound of wood crackling
  - d. Feel the ashes with your bare hand
  - e. Spit on it and wait for a hissing sound
9. True or False. When breaking camp, you should leave a pile of wood at the campsite for the next camper.
10. List three steps for erasing all trace of your campfire.
  - a.
  - b.
  - c.

## ANSWERS

1. b. On a lake shore. Plants on lake shores are easily damaged because these areas are so popular. People fish, dive, and walk next to the water. If you camp at least 200 feet away, you can prevent your tent and campfire from contributing to the general trampling.
2. False. If you build your fire in a safe location after clearing away the needles and duff and watch it, it will not spread with or without rocks. Any rocks that you do use will turn black.
3. All of these animals need snags either as a home or as a source of food.
4. c. Pour pots of water over your head on shore. This prevents soap from polluting the water.
5. False. Soup and drink packets usually are lined with aluminum foil. Aluminum breaks up but does not burn. You can find it abandoned in almost any fire ring left behind in the Wilderness. It should be packed out.
6. False. The bears almost always dig up these pits and scatter the garbage. This garbage should be packed out.
7. d. Five to six inches. This keeps the wastes in the humus layer where there are countless microorganisms to decompose it.
8. d. Feel the ashes with your bare hands. If the ashes still feel warm, drown the fire with more water.

9. False. The nicest thing you can do for the next camper is to leave no trace that you were ever there. The Wilderness Act states that "the imprint of man's work" should be "substantially unnoticeable."
10. Any three of the following:
- a. Make sure the fire is out
  - b. Pick out any unburned trash
  - c. Scatter the rocks
  - d. Scatter the ashes
  - e. Spread needles and twigs over the site

8 to 10 Right Answers: "Mountaineer" -- you have earned the title "No-Trace Camper".

5 to 7 Right Answers: "Explorer" -- study some more before you begin your trip.

Less than 5 Right Answers: "Duffer" -- you need to re-take the course before entering the wilderness.

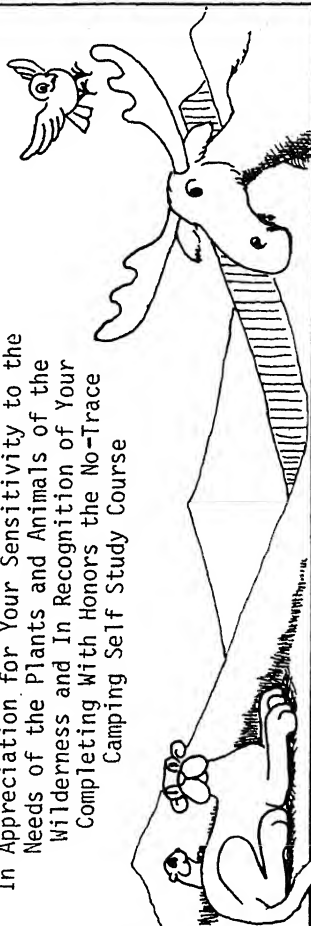
The Wildlife  
of the Selway-Bitterroot Wilderness  
Hereby Confer Upon



The Honorable Title Of

*No-Trace Camper*

In Appreciation for Your Sensitivity to the  
Needs of the Plants and Animals of the  
Wilderness and In Recognition of Your  
Completing With Honors the No-Trace  
Camping Self Study Course



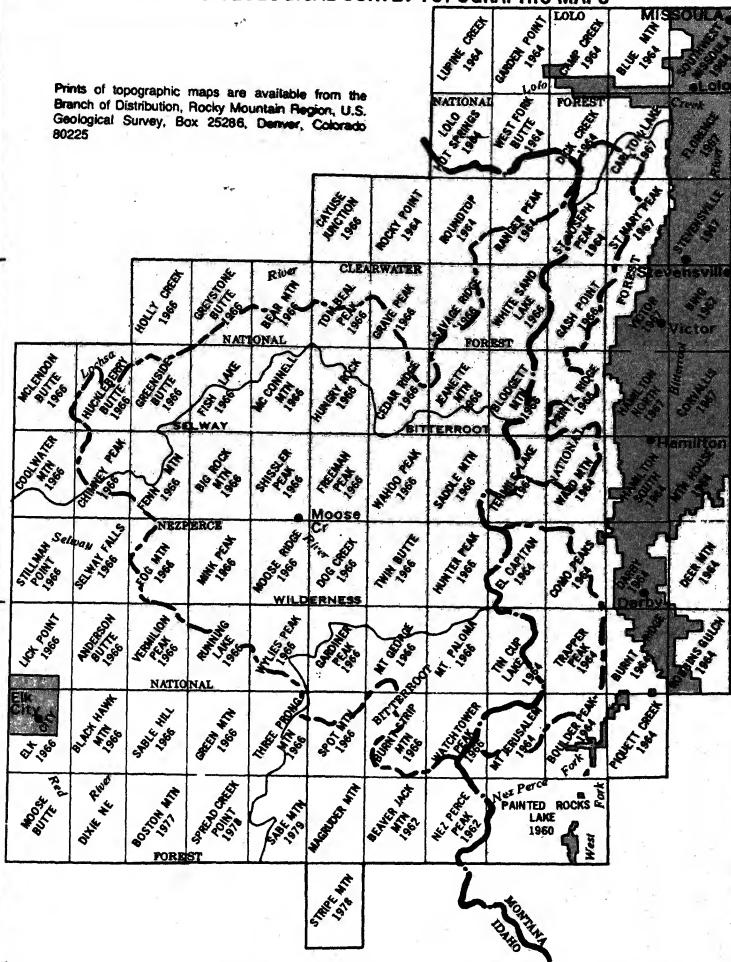


30' 115°00' 30' 114°00'

The map displays the Snake River region in Idaho, with a grid of latitude and longitude coordinates. The map includes various land management areas, towns, and geographical features. Key features include:

- Land Management Areas:** NATIONAL FOREST, SELWAY, CLEARWATER, BITTERROOT, WILDERNESS, and various National Monuments like Huckleberry and Nez Perce.
- Towns:** Shoshone, Victor, Hamilton, and Blaine.
- Rivers:** Snake River, Salmon River, and Boise River.
- Other features:** A large shaded area representing the Snake River Canyon, and a small inset map of Idaho in the bottom left corner showing the location of the study area.

The map is overlaid with a grid of latitude and longitude coordinates. The latitude ranges from 46° 00' N to 46° 30' N, and the longitude ranges from 114° 00' W to 115° 00' W.



## ENGINEERING SPECIFICATIONS.

**73. Engineering Specifications Defined.** Engineering specifications consist of a series of specific provisions each one of which defines and fixes some one element of the contract. These clauses relate, in general,

*First:* To the work to be done.

*Second:* To the business relations of the two parties to the contract.

In the first sense, the specifications supplement and explain the plans (if there be any) and define the character of the materials and the methods to be employed on the work, or if unaccompanied by plans they embody the principles and rules in accordance with which the plans must be drawn and the work executed. In this sense the specifications enable the bidder to estimate the cost of the proposed work and after the contract is let they serve as the rules of inspection and acceptance of such work.

In the second sense the specifications define the rights and duties of the two parties to the contract to each other and embody proper provisions for changes in the plans, and for the settlement of disputes which may arise; they also describe the conditions of payment, acceptance, etc., etc.

**74. Classes of Specifications.** There may be said to be three general classes of engineering specifications:

- (a) Specifications accompanying complete detail plans;
- (b) Specifications accompanying a general plan only.
- (c) Specifications unaccompanied by any plan, and commonly known as General Specifications.

All of these classes of specifications are in common use and each has its own particular sphere of usefulness.

(a) Thus when the design is novel, or when the engineer

detail plans, or drawings, showing how all parts of the proposed work shall be done.

In the case of public works, also, when the law requires the contract to be let in open competition, and also specifies that it shall be let to the lowest bidder, it is almost necessary to prepare full detail plans in order to avoid an inadequate or inferior design being put into competition with better ones, and, from its diminished cost, receiving the contract.

(b) If the engineer can limit the bidders to a selected class of reliable contractors, who have reputations to lose if they should do inferior work, he may prepare very general plans only and allow the contractor to make the details to suit himself, in accordance, however, with certain specific requirements as given in the specifications, and subject to the approval of the engineer.

(c) If the engineer is indifferent as to even the general design, provided the finished work answers equally well certain prescribed demands, as given in a set of general specifications, he may not prepare any plans whatever, but leave the contractor (who must now also be chosen by the engineer or only responsible parties allowed to bid) to use any design he may choose, such designs to be submitted, however, with his bid, and this, together with the general specifications to form the basis of the contract.

**75. General and Specific Clauses.** Any specification may be said to be composed of two kinds of clauses, general and specific.

All those clauses which relate to the business portion of the contract, or which go to define the relations of the parties to the civil contract as a business proposition, may be said to be the general clauses.

All those clauses which are descriptive of the engineering or structural features of the design, either as explanatory of the



plans, or of the materials to be used, or of the methods to be employed, may be called the specific clauses.

Since the general clauses are common to all kinds of specifications, they will be discussed first.

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## THE GENERAL CLAUSES IN SPECIFICATIONS.

76. The General Clauses in Specifications may relate to any or all of the following subjects:

(1) Time of commencement, rate of progress, and time of completion of the work.

(2) As to the character of the workmen to be employed.

(3) Suitable appliances to be used.

(4) Monthly estimates of work done and payments to be made.

(5) Provision for inquiring into the correctness of the monthly estimates.

(6) Reserving a certain percentage as a repair fund, for a stated period after completion.

(7) Conditions of the final estimate.

(8) Engineer's measurements and classifications final and conclusive.

(9) Determination of damages sustained by failure to complete the work within the time agreed upon, or as extended.

(10) The discharge of unpaid claims of work men and material men.

(11) No claims for damages on account of suspension of work.

(12) No claims for damages on account of delay.

(13) No claims on account of unforeseen difficulties.

(14) Protection of finished work.

(15) Protection of property and lives.

(16) Protection against claims for the use of patents.

(17) Assignment of contract.

- (18) Contractor not released by subcontracts.
- (19) Abandonment of contract.
- (20) Cancellation of contract for default of contractor.
- (21) Workmen's quarters and other temporary buildings.
- (22) Cleaning up after completion.
- (23) Removal of condemned material.
- (24) Relations to other contractors.
- (25) Provision for drainage.
- (26) Provision for public traffic.
- (27) Contractor to keep foreman or head workman, and also copy of plans and specifications on the ground.
- (28) Cost of examination of completed work.
- (29) Faults to be corrected at any time before final acceptance.
- (30) Surveys, measurements, and estimates of quantities not guaranteed to be correct.
- (31) The contract subject to interpretation and change by the engineer.
- (32) Settlement of disputes.
- (33) Extra work.
- (34) Definition of "Engineer" and "Contractor."
- (35) Documents composing the contract.
- (36) Meaning understood.
- (37) Provision for Arbitration.
- (38) No Waiver of Legal Right.

**77. Explanatory Note.** In all that follows on the subject of specifications, after explaining and discussing a given subject, one or more illustrations will be given in solid type, from actual specifications, together with the initials of the author. The full name and professional engagement of the author can then be found by referring to the *Key to Personal References*, page 5. In general the latest practice only of the engineers quoted in this way will be cited. It must also be

understood that in every case the gentlemen so quoted have themselves selected the sample specifications used and have consented to such use.

**78. Time of Commencement, Rate of Progress, and Time of Completion of the Work.** It is usual to make the time of commencement of the work as soon after the signing of the contract as is thought practical, as, for instance, ten, fifteen, or thirty days, depending on the character of the work.

The rate of progress is specified in order to give the engineer authority for canceling the contract if the rate of progress is such as to indicate that the contractor will certainly be unable to complete the work on time, or at all. Thus he may be obliged to abandon the work altogether, or he may choose to do so, in which case, if rate of progress is specified, the parties of the first part need not wait for the full time for completion to arrive before being able to take the work from the hands of the contractor and complete it by hiring the labor and purchasing the materials, or by reletting it to another contractor.

The time of completion is nearly always stated, and while the time allowed should be ample it should be only such as is required when a reasonable degree of diligence is exercised on the part of the contractor.

If, for any sufficient reason, the contractor is delayed in his work, for reasons beyond his control, the time of completion is usually extended by the principal by a corresponding length of time, and then this extended period fixes the required, or specified date of completion.

And the said party of the second part further agrees that he will commence the work herein contracted to be done within twenty days from the date of this contract; that the rate of progress of his work shall be such as, in the opinion of the Engineer, is necessary for completion within the time herein specified, and that he will so conduct the said work that on or before July 1, 1899, the whole work covered by this contract and specification shall be entirely completed.

A. F.

**79. As to the Character of the Workmen to be Employed.** In order to secure good work it is necessary to employ skilled workmen. The engineer must therefore have some control over the character of the labor employed by the contractor. This is obtained by specifying that only skilled labor shall be employed and giving to the engineer the power of discharge over any laborer, mechanic, foreman, or superintendent employed by the contractor on the work. It is also customary to provide that this power shall extend to cases of disobedience of instructions, impudence to engineer or inspectors, drunkenness, etc., as shown in the following illustration:

And the said party of the second part further agrees to employ only competent, skillful men to do the work; and that whenever the Engineer shall inform said party of the second part in writing that any man on the work is, in his opinion, incompetent, or unfaithful, or disorderly, such man shall be discharged from the work, and shall not again be employed on it.

A. F.

**80. Suitable Appliances to be Used.** If not prevented by a special clause in the specifications, contractors who are unprovided with suitable mechanical appliances for doing the work properly will often undertake to perform the work with cheap and inadequate means, which would necessarily result in faulty construction, or in delaying the work. It is customary, therefore, to prescribe that all appliances shall be suitable and adequate to the purpose, and subject to the approval of the engineer. It is not wise, however, to specify particular methods or means of doing the work, since if for any reason a partial failure should result, the contractor will endeavor to obtain personal release by charging failure to the specified appliances or methods. A specification like the following is therefore recommended.

The contractor is to use such methods and appliances for the performance of all the operations connected with the work embraced under this contract as will secure a satisfactory quality of work and a rate of progress which, in the opinion of the engineer, will secure the completion of the work within the

time herein specified. If, at any time before the commencement, or during the progress of the work, such methods or appliances appear to the engineer to be inefficient or inappropriate for securing the quality of the work required or the said rate of progress, he may order the contractor to increase their efficiency or to improve their character, and the contractor must conform to such order; but the failure of the engineer to demand such increase of efficiency or improvement shall not relieve the contractor from his obligation to secure the quality of work and the rate of progress established in these specifications.

A. F.

**81. Monthly Estimates of Work Done and Payments to be made.** It is customary, in all kinds of engineering construction, for the engineer in charge to estimate at the end of each month the quantity of material furnished on the ground, and of work done. These estimates are approximate only and serve as a basis for making monthly payments to the contractor. It is customary to reserve from ten to twenty-five per cent. of these monthly estimates until the final completion of the work. By means of these monthly payments the contractor is enabled to carry on the work to final completion with a much smaller capital than would be required if no payments were made until the work was finished. The percentage reserved from the monthly payments is intended to serve as a guarantee of final completion, and as a fund to draw upon when the time of final settlement arrives, for the payment of damages resulting from the work not having been performed within the specified time, or for other purposes as indicated subsequently in these general specifications. In the matter of payment for materials furnished, but not incorporated finally into the work, it is usually considered safe to include in the monthly estimates all materials delivered, either upon the ground, that is to say along the line of the work, and subject to the inspection and control of the engineer, and also to pay for materials and machinery furnished and stored where they are under the control and subject to the inspection and approval of the engineer. Of course no material would be included in

These monthly estimates which had not been duly inspected and accepted.\* The following is a common form for this specification:

In order to enable the said contractor to prosecute the work advantageously, the engineer shall, once a month, on or about the last day of each month, make an estimate in writing of the amount of work done, and materials delivered to be used in the work,\* and of the value thereof, according to the terms of this contract. The first such estimate shall be of the amount or quantity and value of the work done and materials delivered since the party of the second part commenced the performance of this contract on his part. And every subsequent estimate (except the final one) shall be of the amount or quantity and value of the work done since the last preceding estimate was made. And such estimates of amount and quantity shall not be required to be made by strict measurement or with exactness; but they may, at the option of the engineer, be approximate only.

Upon each such estimate being made the parties of the first part will pay to the party of the second part the following proportions or percentages thereof, to wit:

85 per cent. thereof up to and until such time as the total estimated value of the work done and materials delivered shall amount to \$1,000,000.

90 per cent. thereof after the total estimated value of such work and materials delivered shall have amounted to \$1,000,000, until the party of the first part shall have fully and completely performed this contract of his part.

A. F.

82. Provision for Inquiring into the Correctness of the Monthly Estimates. The monthly estimates made by the engineer acting as the agent of the party of the first part, may be held to be binding upon this party, in case he has either made a mistake in the quantity of work done, or material furnished, or has entered into collusion with the contractor, and rendered false returns. Since the engineer is the agent of the party of the first part, his acts would bind his principal, after payment had been made on the same, if it were not expressly provided that the party of the first part shall not be estopped, or prevented, from determining by other means

\*If payment is made upon materials furnished, then it should be specifically stated that all such materials become the property of the party of the first part.

the amount of work done and material furnished. In other words the party of the first part should not necessarily be bound by either the monthly or final estimates rendered by his agent, and which are intended to serve as the basis of payment. It is understood, of course, that the contractor also has this privilege of inquiry and proof of the correctness of the estimates.\* In New York City clauses like the following are common.

And it is hereby expressly agreed and understood by and between the parties hereto that the said parties of the first part, their successors and assigns, shall not, nor shall any department of the City of New York, be precluded or estopped by any return or certificate made or given by any engineer, inspector, or other officer, agent or appointee of said Aqueduct Commissioners, or of said parties of the first part, under or in pursuance of anything in this agreement contained, from at any time showing the true and correct amount and character of the work which shall have been done and materials which shall have been furnished by the said party of the second part, or by any other persons under this agreement.

A. F.

83. Reserving a Certain Percentage as a Repair Fund, for a Stated Period after Completion. In order to provide for inherent defects in the work which may not appear on the surface, or until after the construction has been in service for some time, it is often desirable to retain a portion of the total cost of the work for a specified period of time, on which sum the party of the first part is authorized under the specifications to draw for the repairing or correcting of any and all faults or defects which may become apparent by use within the specified period. It is usual, however, to give the contractor the privilege of making such repairs under the direction, and subject to the approval, of the engineer, in place of having the engineer make such repairs and charge them against the reserve fund. This clause may read as follows.

The contractor hereby further agrees to make all the needed repairs on the said work during a period of ——— months after its final completion; and he hereby further agrees that the

\* If the contractor is precluded from going back on the engineer's certificate or decision, then the owner should also be bound by the same, and in this case this clause would probably not be sustained by the courts. The engineer is now an arbitrator and as such his decisions must bind both parties — neither.

party of the first part is authorized to retain out of the moneys payable, or to become payable, to him, under this agreement, the sum of five per cent. on the amount of the contract, and to expend the same, or so much thereof as may be required, in making the aforesaid repairs to the satisfaction of the engineer, if within three days after the delivery or mailing of a notice in writing to the contractor, or his agent or attorney, he or they shall neglect to make the aforesaid needed repairs; and he hereby further agrees to be responsible for any accident that may occur on account of the defective condition of the work.

E. A. F.

**84. Conditions of the Final Estimate.** If, in the opinion of the engineer, the contractor has completed his work in all respects in accordance with the terms of the contract, he should proceed with due diligence to make the final estimate of all quantities in the several clauses, and to certify to his principal the amount of money due to the contractor, and also the amounts which should be held in reserve under the various clauses of this character in the specifications. The party of the first part thereupon should immediately pay to the contractor such moneys as are legally due him, provided this party is satisfied that the final estimates submitted by the engineer are correct. If this party should have any doubts on this point, he should be at liberty, under the specifications, to enquire further into the correctness of such estimates. This portion of the contract may be stated as follows.

It is further mutually agreed, that whenever this contract, in the opinion of the engineer, shall be completely performed on the part of the contractor, the engineer shall proceed with all reasonable diligence to measure up the work, and shall make out the final estimates for the same and shall certify the same. The party of the second part will then, excepting for the cause herein specified, pay to the contractor, within — days after the execution of said certificate the remainder which shall be found to be due, excepting therefrom such sum or sums as may be lawfully retained under any of the provisions of this contract: Provided that nothing herein contained shall be construed to affect the right hereby reserved, to reject the whole or any portion of the aforesaid work, should the said certificate be found to be inconsistent with the terms of this agreement, or otherwise improperly given.

E. A. F.



85. **Engineer's Measurements and Classifications Final and Conclusive.** In order to avoid disputes as to both the quantity and the quality of the work done, it is customary to specify that the measurements and classifications of the engineer shall be final and conclusive, and binding upon both parties. This is a very important provision, and places a great responsibility upon the engineer, while it binds, at the same time, the two principals to the contract, and forces them to submit to the engineer's decisions, except as some special provision such as that stated in article 81 allows one or both of the parties to examine into the correctness of the engineer's estimates. As a matter of course either party is always at liberty to examine questions of fact and, so far as it is practicable, to remeasure quantities at subsequent times. Either party would be at liberty in case of a suit at law to have such quantities remeasured to determine such question of fact, but so far as the classification of the material is a matter of opinion on the part of the engineer, and so far as measurements of quantities have become impracticable at a subsequent period, to this extent a clause such as is here proposed binds absolutely both parties to the contract. Neither party now has any release from the decision of the engineer, except on one of two grounds:

*First.* Either party may bring a suit in equity, in which case the terms of the contract are not made the basis of the suit; or

*Second.* Either party may enter a plea of fraud on the part of the engineer, which, if sustained, would of course vitiate the decisions of such engineer. Neither of these grounds offers much encouragement to either party. A case could not be sustained in equity contrary to the terms of an expressed written agreement, except it could be shown that gross and violent injustice had been worked by a strict compliance with its terms. Neither is it desirable in a civil suit to enter a plea

maintained by proving the moral depravity of the engineer. A clause such as the following, therefore, if incorporated in a contract and agreed to by both parties places both parties absolutely at the mercy of such engineer, and the contractor should never submit to it, if he has reason to suppose that the engineer is likely to act unfairly toward him under the authority thus granted to him. As a rule, however, this confidence which is reposed in the engineer by both parties to the contract is not misplaced. Although the engineer is paid for his services by one of the parties to the contract, he understands that his position is a judicial one, and not that of an advocate or partisan, and that it is his business to see that justice is done to both of the parties. The clause usually reads as follows.

All the work under this contract shall be done to the satisfaction of the engineer, who shall in all cases determine the amount, quality, acceptability and fitness of the several amounts of work and materials which are to be paid for hereunder, and shall decide all questions which may arise as to the measurement of quantities and the fulfillment of this contract on the part of the contractor, and shall determine all questions respecting the true construction or meaning of the plans and specifications, and his determination and decision thereon shall be final and conclusive, subject only to revision by arbitration as provided under Art. —.

R. H.

**86. Determination of Damages Sustained by Failure to Complete the Work within the Time Agreed upon, or as Extended.** It is seldom that a specific performance of any contract can be enforced. In other words, either of the parties to almost any civil contract is at liberty to break the same, or fail to carry it out, for which failure, however, the law provides that the party breaking the contract shall pay a penalty. The amount of this penalty usually remains to be ascertained after the contract has been broken, and when the time of settlement arrives. The legal remedies for breach of contract are given in Arts. 49-53. It

\* Here should be inserted a clause like the following: "And such estimate and decision shall be a condition precedent to the right of the contractor to receive any money or compensation for anything done or furnished under this agreement."

is sufficient to remark here, that in determining the amount of the damages, the law will only allow the actual proven damages to be collected, and always discourages any constructive, or conventional, or arbitrary estimate of such damages. In other words, the damages are the compensation to the injured party, requisite to repay him for his loss, which can be traced directly to the breach of contract.

While damages to the extent of the actual injury sustained can always be recovered, by a suit at law, in the case of a breach of contract, it is customary in the writing of engineering specifications to insert one or more clauses defining the amount of the damages which it is agreed by the parties will be sustained in case of certain specific failures to carry out the contract; and since these failures are assumed to be on the part of the contractor, and since money is usually due him from the other party, it becomes possible, in this case, to remunerate the injured party by withholding a certain sum of money from the contractor who is guilty of the breach of contract. If a specific agreement to this effect be entered into by the parties, in advance, the compensation for the injury done because of a specific breach of the contract, may be recovered by simply withholding such a sum from the contractor, and paying over to him in final settlement the remainder. Because, therefore, of the facility with which such a settlement can be accomplished, and also to further provide against such a contingency arising by furnishing to the contractor a sufficient motive to prevent such specific breaches, and furthermore, in order to avoid a suit at law for the recovery of such compensation, it has become customary to insert what is commonly called a "penalty clause." \*

While recovery can be had by a suit at law for the actual damages sustained for any breach of the contract, either with or without a specific clause to this effect, the penalty or dam-

\* The reader is requested to refer to Arts. 51-53 for a discussion of the legal phases of this question.

age clause in the specifications usually refers to one or more specific kinds of breach of contract, the more common one being that of failure to complete the work within the time agreed upon. The object of a penalty clause covering this particular kind of breach of contract is rather to insure completion of the contract within the time specified than to recover damages for a failure to do so. For this reason it has been commonly supposed if a heavy penalty were provided for a failure of this kind, it would serve as a strong motive to the contractor to hasten the work. This being the object of such a clause it has been common to specify a penalty or damage of so many dollars per day, for each and every day elapsing after the date agreed upon for the completion, before the work is finally completed, the sum so named being often a very extravagant one.

There are several ways of stating this clause, some of which are very much better than others. The following are the more usual forms:

I. *Provision for a specific "penalty."* When a specific "penalty" is named for either a particular or for any breach of the contract, whether this sum named be a per diem, or a gross amount, the court will usually construe it as meaning that such a sum is a fund provided in the specifications for the purpose of meeting such damages as may result from a breach of the contract, and that only the actual damages sustained and proved in a suit at law can be recovered from such fund. In other words, a penalty clause so stated has little or no force, since the law provides exactly the same remedy for any breach of contract, without a specific agreement.

II. *The naming of a per diem, or gross sum, as being the "ascertained and liquidated damages"* which will be sustained by the injured party for a specific breach of contract therein named, this usually being for failure to complete the work within the time specified. In this case the word "penalty"

is not used, and if it can be made to appear on trial that both parties to the agreement really intended that the sum named should be forfeited in case of the failure therein described, and provided further this sum is not too extravagant and unreasonable, and provided the fact of failure and consequent liability be fully established, then and in that case the law will sustain the damage clause, and the injured party will be allowed to deduct it from any moneys due the contractor, or if this fund be insufficient, he may even sue the contractor and his bondsmen and recover the remainder. The following is a good example of this method of stating such a clause:

And the said party of the second part hereby further agrees that the said parties of the first part shall be and they are hereby authorized to deduct and retain out of the money which may be due or become due to the said party of the second part, under this agreement, as damages for the non-completion of the work aforesaid within the time hereinbefore stipulated for its completion, or within such further time as in accordance with the provisions of this agreement shall be fixed or allowed for such performance or completion, the sum of one hundred dollars per day for each and every day the time employed upon said work may exceed the time stipulated for its completion, or such stipulated time as the same may be increased, as hereinbefore provided, which said sum of one hundred dollars per day is hereby, in view of the difficulty of estimating such damages, agreed upon, fixed and determined by the parties hereto as the liquidated damages that the parties of the first part will suffer by reason of such default, and not by way of penalty.

A. P. B.

III. *An agreement that the engineer shall ascertain and make an estimate of the actual damages sustained by a failure to complete the work within the time specified (or for other specific breach), and naming some or all of the items to be included in such estimate.* In this case no effort is made in advance to determine what the actual damages are, and the agreement simply consists in making the engineer an arbitrator to act for both the parties, in determining the amount of the damage as a question of fact. This is probably the strongest

method of stating this clause, while it is also the fairest to all parties concerned.

Because of the difficulty in proving in a suit at law the actual damages sustained from the failure to complete an engineering contract within the time specified, the contractor usually pays very little attention to a penalty clause stated as described above in form I. As a rule, contractors are better informed as to the law of contracts than the engineers who write the specifications, and when this clause is stated as first described the contractor regards it lightly, well knowing that it has no particular significance. When stated in the second manner, however, provided the sum named be reasonable, the contractor will give it much greater weight, and the party paying for the work can withhold money under it with much greater assurance of being sustained by the courts. The courts, however, have a repugnance to any agreement made in advance as to questions of fact, which in the nature of things could only be adequately determined after the breach had transpired. But because of the difficulty of fixing accurately the amount of such damages, even after the breach, the law consents to a previous agreement upon a specific sum, provided this be reasonable, and provided it be so clearly stated that the parties signing the contract can not have misconstrued it. Concerning the last method given of stating this clause, the law also has a repugnance to delegating the authority of the court to a layman in the person of an arbitrator. When, however, the question at issue is a "*condition precedent*" to settlement, as in this case of fixing the amount of the damages, and when this arbitrator is the engineer in charge of the work, who is evidently the most competent person to estimate the amount of such damage, the law readily consents that he should act in such capacity, and if both parties have agreed that his decision should be final and conclusive in the premises, there would seem to be no way of evading his decision, except by proving that it was fraudulent. As fraud

invalidates nearly all agreements, and nearly all obligations, if it can be shown that the engineer, when acting in the capacity defined in this clause, has knowingly and willfully overestimated the amount of the damage; in other words, if it can be shown that he acted dishonestly in the matter, his verdict can be set aside and the matter can come before the court. Otherwise the court will rule that his verdict must hold, and the question can not be opened. As it is very difficult to establish a question of motive, and as the burden of proof rests wholly upon the contractor, it would seem that this method of writing the damage clause had many advantages. The following is a fair example of such a clause.

In case said contractor shall fail to fully and entirely, and in conformity with the covenants, terms and agreements of this contract, perform, and complete said work, and each and every part and appurtenance thereof, within the time hereinbefore limited for such performance and completion, or within such further time as may be allowed by said Board for such performance and completion, said chief engineer shall appraise the value of the direct and computable damages caused to said city by such failure, owing to the disbursements made by said city on account of the further employment of engineers, inspectors and other employees, including all disbursements for office rent, transportation, supplies, and other matters connected with said employment; also the value of such other direct and computable damages as shall be caused by such failure; and the amount so appraised, when approved by said Board, shall be deducted by said Board out of such moneys as either may be due, or at any time thereafter become due, to said contractor under and by virtue of this contract, or any part thereof; and in case said appraised value shall exceed the amount of said moneys, then said contractor will pay the amount of such excess to said city, on notice from said Board of the excess so due; and it is hereby agreed that the decision of said chief engineer as to the said appraisal, when approved by said Board,\* shall be final and binding on both parties to this contract.

E. K.

**87. The Discharge of Unpaid Claims of Workmen and Material men.** The laws of many states provide that persons, who supply either labor or material to any con-

\*It may or may not be wise to make the verdict of the engineer subject to the approval of his principal.

tractor or other person, to be used in the construction of any building or other permanent work, if not paid by such party, may file a lien upon such completed or uncompleted work, this serving as a kind of first mortgage upon the property, under which the property can be sold and the claim satisfied. When such a law obtains, the only safe course, for the person paying for the work, is to satisfy himself before he fully pays for the work that all such claims have been liquidated, or he may if he choose, require the contractor to furnish a bond which may be sued upon, either by himself, or by such material man or laboring man as may have such a claim. This bond to be large enough to cover all such liabilities.

When the party paying for the work desires to satisfy himself that such claims have all been discharged by the contractor, the clause may be written as follows:

Said contractor further agrees that he will pay punctually the workmen who shall be employed on the aforesaid work, and the persons who shall furnish material thereunder, and will furnish said Board with satisfactory evidence that all persons who have done work or furnished materials under this contract and shall have filed any account of such claims with said Board, have been fully paid, or are not entitled to any lien under the laws of this state; and in case such evidence be not furnished as aforesaid, such amount as said Board may consider necessary to meet the lawful claims of the persons aforesaid, shall be deducted from the moneys due said contractor under this contract, and shall not be allowed until the liabilities aforesaid shall have been fully discharged and the evidence thereof furnished said Board; and if such evidence is not furnished before the final payment under this contract falls due, said Board may pay such claims in whole or in part to the person or persons, firm or corporation claiming the same, and charge the amount thus paid to said contractor, who shall accept the same as payment to the amount thereof upon this contract.

E. K.

When the party paying for the work does not care to put himself to the trouble of obtaining the information as to the discharge of all such claims by the contractor, he may so frame



the wording of the bond that it will cover this case satisfactorily. In this case this portion of the bond may read as follows:\*

The said———as principal, and———and——— as securities, hereby bind themselves and their respective heirs, executors or administrators, unto the City of St. Louis, in the penal sum of——dollars, lawful money of the United States, conditioned that in the event the said———shall faithfully and properly perform the foregoing contract according to all the terms thereof, and shall, as soon as the work contemplated by said contract is completed, pay to the proper parties all amounts due for material and labor used and employed in the performance thereof, then this obligation to be void, otherwise of full force and effect, and the same may be sued on at the instance of a material man, laboring man, or mechanic, for any breach of the condition hereof; provided, that no such suit shall be instituted after the expiration of ninety days from the completion of the above contract.

**88. No Claims for Damages on Account of Suspension of Work.** When the work contracted for is of a public character, as for a city, or for the United States Government, and when it is expected to continue for a considerable period, and be paid for by appropriations from time to time, and also in other like contingencies, it is common to insert a clause to the effect that the contractor shall make no claim for damages for necessary delays he may experience in carrying out the work, when these delays are caused by the failure of appropriations, or by legal proceedings, and the like.

On ten days notice the work under this contract may, without cost or claims against the party of the first part, be suspended by them for want of funds, or for other substantial cause. Upon receipt by the contractor of the order for the suspension of the work, all the materials shall be piled up compactly, so as not to impede travel on the sidewalk or carriageway, or the use of fire plugs, gas or water stops, and all surplus material and rubbish shall be removed immediately from the street. When the party of the first part shall order the work to be resumed the contractor shall complete the same upon the terms and conditions of this contract.

E. A. F.

\*This is the form universally adopted in all contracts made by the City of St. Louis. If not specifically so stated the material man, or the laboring man could not sue on the bond.

**89. No Claims for Damages on Account of Delay.** In order that the party of the first part shall be freed from all claims which may be set up by the contractor for damages on account of various delays and hindrances which he may have experienced in carrying out the work, and which he may make appear to have been caused directly or indirectly by the party having the work done, or by other contractors upon the work, the following clause is often inserted:

The contractor shall not be entitled to any claims for damages for any hindrance or delay from any cause whatever in the progress of the work, or any portion thereof, but said hindrance may entitle said contractor to such extension of time for completing the contract as may be determined by the engineer, provided, he shall have given notice in writing of the cause of the detention.

E. A. F.

**90. No Claims on Account of Unforeseen Difficulties.** In case it is the purpose of the contract to place upon the contractor all the responsibility for contingencies which may arise in the prosecution of the work, for which greater risk the party having the work done will, of course, pay in the increased price made by the contractor to cover such risk, the clause may be written as follows:

The contractor agrees that he will sustain all losses or damages arising from the action of the elements, the nature of the work to be done under the specifications, or from any unforeseen obstructions or encumbrances on the line of the work which may be encountered in the prosecution of the same.

E. A. F.

**91. Protection of Finished Work.** It is usually customary to hold the contractor responsible for the protection and care of the work until it is all finally completed and accepted. Even such portions of the work as have been completed and provisionally accepted and payments made upon the same, should be taken care of and fully protected by the contractor, until the entire work has been turned over. This often entails considerable expense upon the contractor, and when dis-

putes on this question are liable to arise, it is well to insert such a clause as the following:

Contractors will be held responsible for any and all materials or work to the full amount of payments made thereon, and they will be required to make good, at their own cost, any injury or damage which said materials or work may sustain from any source or cause whatever, before final acceptance thereof.

O. M. P.

**92. Protection of Property and Lives.** It is always understood that the contractor shall be held responsible for all damages to property which may arise from any fault of his, or from any accident which may occur during the performance of the work. He is also held responsible for all losses of life or limb, and for all personal damages which may be sustained either by his own workmen or by the public, by or on account of the works he has under construction. In other words, it is made his duty to protect both life and property, so far as possible, from all damage, so far as these may be traceable to the works themselves. If this responsibility were not specifically placed upon the contractor, the party having the work done would often be obliged to sustain the loss, since he authorizes the execution of the work, and the contractor is his employee or agent. This clause is often written as two separate clauses, one referring to the damage to property, and the other to the damage to persons.

Furthermore the wording of the bond is usually so made as to cover both of these items, so that in case the damage or loss is greater than could be repaid by the amount of money at any time due the contractor when the accident occurs, suit may be brought upon the bond against the bondsmen to recover the remainder.

Inasmuch as claims for damages, either to person or property, usually manifest themselves in the form of suits at law against the party authorizing the work and paying for the same, and not against the contractor himself, it is common to assume

that this will be the case in all claims for damages, and to word the clause accordingly. The following clause covers all of the above contingencies in an acceptable manner:

Said contractor further agrees that he will indemnify and save harmless said City and Board, and the officers and agents thereof, from all claims, suits, actions, and proceedings of every name and description, which may be brought against said City or Board, or the officers and agents thereof, for or on account of any injuries or damages to persons or property received or sustained by any person or persons, firm or corporation, by or from said contractor, or by or in consequence of any materials or explosives used on said work, or by or on account of any improper material or workmanship in its construction, or by or on account of any accident, or of any other act or omission of said contractor, or his agents, or servants, and said contractor also agrees that so much of the money due, or to become due, to him under this contract as shall be considered necessary by said Board, may be retained by said Board until all such suits or claims for damages, or otherwise, as aforesaid, shall have been finally settled and determined, and evidence to that effect furnished to the satisfaction of said Board.

E. K.

The following is a common method of wording this clause, which defines the contractor's responsibility without referring to suits at law:

The contractor shall put up and maintain such barriers and red lights as will effectually prevent any accident in consequence of his work, for which the city might be liable, and he shall be liable for all damages occasioned in any way by his acts or neglect, or that of his agents, employees, or workmen.

E. A. F.

**93. Protection against Claims for the Use of Patents.** When it is anticipated that patented appliances or methods may be used either by the contractor in prosecuting the work, or as forming a part of the completed work itself, in order that the party authorizing the work may be able to collect from the contractor such fees as he may be forced to pay therefor, a special clause in the specifications may be written to cover this case. This clause may be as follows:

All fees for any patented invention, article or arrangements that may be used upon or in any manner connected with

the construction, erection, maintenance of the work, or any part thereof embraced in these specifications, shall be included in the price mentioned in the contract, and the contractor shall protect and hold harmless the party of the first part against any and all demands for such fees or claims, and before the final payment or settlement is made on account of the contract, the contractor must furnish acceptable proof of a proper and satisfactory release from all such claims.

E. A. F.

**94. Assignment of the Contract.\*** If it is the intention of the party letting the work that the person or persons who take the contract shall perform the work themselves, without subletting it, it is necessary to prescribe that this shall be done in order to insure that it may not be sublet. One great objection to the subletting of contracts is that the subcontractor can not be held directly by the principal, since these two have not entered into contract. The principal can only hold the original contractor, and all dealings with the subcontractor must be through him. This gives rise to delays and unsatisfactory performance, and is usually prohibited by the specifications. The following form is adequate to this purpose:

Said contractor further agrees that he will give personal attention constantly to the faithful prosecution of the work, and will not assign or sublet the work or any part thereof, or any of the moneys or orders payable under the contract, without the previous written consent of said board endorsed on this contract, but will keep the same under his personal control; that no right under this contract, nor to any moneys or orders due or to become due hereunder, shall be asserted against said city or board, or any department, officer, or officers thereof, by reason of any so-called assignment, in law or equity, of this contract, or any part thereof, or of any moneys or orders payable thereunder, unless such assignment shall have been authorized by the written consent of said board endorsed on this contract; that no person other than said contractor now has any claim thereunder, and that no claim shall be made excepting under this specific clause of this contract, and under that clause relating to claim of workmen and materialmen. E. K.

**95. Contractor not Released by Subcontracts.**

When it is anticipated that a portion at least of the work

\*See Article 30.

will be sublet to other contractors, and when in the nature of things this is advisable, it may be specified that such subletting of all or of any portion of the work in no wise releases the contractor from full and faithful performance. The following specifications would then hold:

No subcontract shall under any circumstances relieve the contractor of his liabilities and obligations under his contract; should any subcontractor fail to perform the work undertaken by him in a satisfactory manner, and should this provision be violated, the party of the first part may at their option end and terminate such contract.

E. A. F.

**96. Abandonment of Contract.** In most large engineering contracts it is wise to provide for the emergency of abandonment. This term is here used to include not only deliberate and acknowledged abandonment of the work on the part of the contractor, but also such violations of the contract, either in the letter or in the spirit, or such unnecessary delay in its execution as may be construed as a virtual abandonment of the contract, so far as its express fulfillment is concerned. In such cases it may become necessary or desirable to take the work out of the hands of the contractor altogether, and to hire the necessary labor and purchase the necessary material, and complete the work under the direct superintendence of the engineer, charging all such items of expense against the contractor, and providing for the payment of the same, even though they should exceed all moneys due the contractor on the completion of the work. While the common law would warrant the party paying for the work in assuming the control of it, and charging the cost of the same against the contractor, in case of his express and acknowledged abandonment, it would not authorize the engineer in assuming control of the work because of delay or other violations of the terms of the contract. A provision such as the following may therefore be inserted:

Said contractor further agrees that if the work to be done under this contract shall be abandoned, or if this contract shall be sublet or assigned by said contractor, or any of the moneys

or orders payable thereunder shall be assigned, otherwise than as herein provided, or if at any time said chief engineer shall be of the opinion, and shall so certify in writing to said board, that the said work is unnecessarily or unreasonably delayed, or that said contractor is willfully violating any of the terms, covenants and agreements of this contract, or is not executing this contract in good faith, or is not making such progress in the execution of said work as to indicate its completion within the required time, said board shall have the power and right to notify said contractor to discontinue all work or any part thereof under this contract, and upon such notification said contractor shall discontinue said work, or such parts thereof as said board may designate; and said board shall thereupon have the power to employ by contract, or otherwise, and in such manner and at such prices as it may determine, any persons and obtain any animals, carts, wagons, appliances, implements, tools, and other means of construction, which it may deem necessary to work at and be used to complete the work herein described, or such part thereof as said board may have designated; also, the power to use such appliances, implements, tools, and materials and means of construction of every description as may be found upon the line of said work, both such as enter into the completed work, and such as are necessarily used in and about the same in the course of construction, and to procure other proper materials for the completion of the same; also to charge the expense of all of said labor, materials, animals, carts, wagons, appliances, implements, tools and means of construction to said contractor; and the expense so charged shall be deducted and paid by said board out of such moneys as may be due or become due at any time thereafter, to said contractor under this contract, or any part thereof. In case such expense is less than the sum which would have been payable under this contract if the same had been completed by said contractor, it is agreed that said contractor shall be entitled to receive the difference; and in case such expense shall exceed the sum which would have been payable under this contract if the same had been completed by said contractor, then said contractor shall pay the amount of such excess to said city, on notice from said board of the excess so due. It is further agreed that neither an extension of time, for any reason, beyond that fixed herein for the completion of the work; nor the performance and the acceptance of any part of the work called for by this contract, shall be deemed to be a waiver by said city of the right to assume control of this contract for the reasons and in the manner hereinbefore provided.

E. K.

**97. Cancellation of Contract for Default of Contractor.** In the previous case it was provided that under cer-

tain contingencies the party of the first part would be warranted in assuming entire control of the work, and completing it under the contract, and for the contractor. His agency in the matter being displaced by that of the engineer, because either of gross violation of the contract, or for incompetency or unwillingness to carry it out. That clause provided, therefore, that the engineer should under such contingencies be appointed to carry out the contract with the party of the second part, in his stead, the contract itself, however, still remaining in force, and the final settlement to be made in accordance with its terms.

For a similar set of contingencies as above described, the party of the first part may prefer to cancel the contract altogether, and instead of completing the work under the supervision of the engineer, he may prefer to let a new contract for the carrying on of the work. To do this, the contract itself must be rescinded or canceled, and in order to give the party of the first part the legal authority for doing this, a clause such as the following may be inserted. Here all moneys due upon the contract at the time the contract is canceled will be forfeited to the first party. See article 49.

In lieu of the exercise of the power hereinbefore given, in case of said contractor's default, to employ workmen, purchase tools and materials, and complete the work, said board reserves the right and option, instead thereof, to annul and cancel this contract and relet the work, or any part thereof, and said contractor shall not be entitled to any claim for damages on account of such annulment, nor shall such annulment affect the right of said city to recover damages which may arise from such failure on the part of said contractor to fulfill the terms of this contract. And in case of such annulment all moneys due said contractor, or retained under the terms of this contract, shall be forfeited to said city, and be paid to the credit of the fund for extending water pipe in said city; but such forfeiture shall, however, not release said contractor, or his sureties for the fulfillment of this contract, and said contractor and his sureties shall be credited with the amount of the moneys so forfeited toward any greater sum that they may become liable for to said city on account of the default of said contractor.

E. K.



**98. Workmen's Quarters and Other Temporary Buildings.** It is usually necessary for the contractor to erect temporary buildings for the protection of his tools and machinery; or for office purposes, and sometimes, when the work is at a distance from boarding house facilities, it is necessary for him to provide temporary quarters for his labor. The location, erection, and removal of such temporary structures should also be subject to the approval of the engineer in charge. If temporary quarters for workmen are not really necessary, it is best to prohibit them, at least to prohibit their erection on the property belonging to the party of the first part. The following is an example of such a clause:

The contractor may build such sheds, storehouses, etc., as are necessary for the work, but the location of such sheds, etc., must be such as will not interfere with the work of other contractors, and must be approved by the water commissioner. No buildings, sheds, or tents to be used as quarters for workmen or teams will be allowed on the city property.\*

*water commissioner*

M. L. H.

**99. Cleaning up after Completion.** In nearly all kinds of engineering construction the grounds surrounding or along the line of the work are necessarily more or less defaced and encumbered by various disturbances of the surface, or by refuse and waste material, temporary buildings, etc., and it is usually made the business of the contractor on the completion of the work to clear up the grounds, and to put them in as presentable a condition as practicable. This does not involve any grading or removal of earth, unless it be the excess or waste which remains on the natural surface from his own excavations. It does, however, include the cleaning up of his own work, whether it be buildings, foundations, masonry, conduits, pits, etc. The following is such a clause written to cover the case of waterworks engine pits:

When the work is completed, all pits, pipes, chambers, conduits, etc., shall be carefully cleaned out: The surround-

\* To which might be added the following: Suitable privy conveniences shall be erected, as directed by the engineer, for the use of the workmen, and their use is made obligatory. The committing of nuisances is prohibited on all parts of the premises.

ing grounds shall be cleared of all rubbish caused by construction, all sheds, etc., and left in a neat and presentable condition.

M. L. H.

**100. Removal of Condemned Material.** Whenever any material which has been brought upon the ground by the contractor has been inspected and rejected by the engineer, or his assistants, it should at once be removed from the line of the work, in order to prevent its use when the engineer or his inspectors are not present. To further insure against the use of condemned material by the contractor, it is sometimes specified that all such material shall be stored by the contractor in a specified place, where it shall be kept under lock and key, and under the control of the engineer only. In case the contractor declines to remove such material from the line of the work, or declines to take out any defective work, there should be a provision authorizing the engineer to do this at the contractor's expense. The following clause may be used:

Defective work and material may be condemned by the engineer at any time before the final acceptance of the work, and when such work has been condemned it shall be immediately taken down by the contractor, and rebuilt in accordance with the plans and specifications. When defective material has been condemned, it shall be at once removed from the line of the work, and stored as directed by the engineer, or otherwise disposed of to his satisfaction. In case the contractor shall neglect or refuse to remove or replace any rejected work or material after a written notice, within the time designated by the engineer, such work or material shall be removed or replaced by the engineer at the contractor's expense.

M. L. H.

**101. Relations to Other Contractors.** Where more than one contractor is expected to be engaged simultaneously upon the same work, it is well to insert a clause in the specifications defining the obligation of each of these contractors to the others in certain particulars as follows:

The contractor is required so far as possible to so arrange his work and to so dispose of his materials as will not interfere with the work or storage of materials of other contractors

engaged upon the work. He is also required to join his work to that of others in a proper manner, and in accordance with the spirit of the plans and specifications, and to perform his work in the proper sequence in relation to that of other contractors, and as may be directed by the engineer.

M. L. H.

**102. Provision for Drainage.** Where the natural surface drainage is likely to be interfered with by the work of the contractor, it may be specified that he shall maintain provision for such surface drainage during the progress of the work, and that he will be held liable for all damages from his neglect to comply with this provision. The clause may read as follows:

If it is necessary in the prosecution of the work to interrupt or obstruct the natural drainage of the surface, or the flow of artificial drains, the contractor shall provide for the same during the progress of the work in such a way that no damage shall result to either public or private interests. For any neglect to so provide for either natural or artificial drainage which he may have interrupted, he shall be held liable for all damages which may result therefrom during the progress of the work.

**103. Provision for Public Traffic.** If it becomes necessary in the prosecution of the work to obstruct the public streets or sidewalks, and if it is practicable to carry on the work without closing these streets against all traffic it should be specified that

The contractor shall make suitable and adequate provision for the safe and free passage of persons and vehicles by, over, or under the work, while in progress. Such provision to be made to the satisfaction of the engineer.

E. A. F.

**104. Contractor to Keep Foreman or Head Workman, and also Copy of Plans and Specifications on the Ground.** Whenever work is visited by the engineer or his assistants or inspectors, the plans and specifications should be available for examination and if instructions are to be given for the further prosecution of the work or for any changes or corrections, some responsible person should always

be present who is authorized to receive such instructions for the contractor, as his agent. In this case the instructions given to this agent have all the legal force which they would have if given directly to the contractor. This clause may read as follows:

At all times when work is in progress, there shall be a foreman or head workman on the grounds, and also copies of the plans and specifications. Instructions given to such foreman or head workman shall be considered as having been given to the contractor.

E. A. F.

#### 105. Cost of Examination of Completed Work.

Whenever the engineer desires to examine work which has been completed in whole or in part, this examination involving the tearing down of some portion of the work, and a corresponding expense both in taking down and in reconstructing it, it is only fair to provide that in case the work should be found to have been performed in accordance with the contract, the cost of tearing down and rebuilding should be paid by the party of the first part; but if it should be found that the work had not been constructed according to the contract, this cost should fall upon the contractor. The following is such a clause:

Whenever required by the water commissioner, the contractor shall furnish all tools and labor necessary to make an examination of any work completed or in progress under this contract. If the work so examined is found to be defective in any respect, or not in accordance with this contract and specifications, the contractor shall bear all expenses of such examination and of satisfactory reconstruction.

If the work so examined is found to be in accordance with the specifications and contract, the expense of examination and reconstruction will be estimated to the contractor at a fair price to be determined by the water commissioner.

M. L. H.

106. Faults to be Corrected at any Time before Final Acceptance. It should usually be understood between the parties that no act of the engineer or of the inspectors should be construed as final acceptance of any portion of the work, unless it is specifically so declared in writing by the engineer.

Also that any failure to detect faulty or incomplete performance before the time of final acceptance should not be construed as an acceptance of the work. After the final acceptance by the engineer, the contract is no longer binding on the contractor in the way of requiring specific performance, but a reservation may be entered in the contract in accordance with which, if any defect or fault should subsequently appear which was undetected before the time of final acceptance, the party of the first part should have the right to recover damages for such fault or defect. A clause to this latter effect is not usually inserted, but it is legitimate if the circumstances should seem to require it. The circumstances might require it when the work is of such a character that faults could not readily be detected until the works had been put in operation. The following is an example of such a combined clause:

Failure or neglect on the part of the engineer or any of his authorized agents to condemn or reject bad or inferior work or materials, shall not be construed to imply an acceptance of such work or materials if it becomes evident at any time prior to the final acceptance of the work and release of the contractor by the party of the first part; neither shall it be construed as barring the party of the first part, at any subsequent time, from the recovery of damages or of such a sum of money as may be needed to build anew all portions of the work in which fraud was practiced or improper material hidden, whenever found.

**107. Surveys, Measurements, and Estimates of Quantities not Guaranteed to be Correct.** It is not usually possible to give in advance complete measurements, dimensions, and estimates for all parts of the work. Especially is this true of the more detailed dimensions. It should always be understood, therefore, that the contractor must be responsible for the proper adjustment of the dimensions and details of the different parts of the work to each other and that the dimensions and figures given on the plans and specifications are always subject to changes during the progress of the work.

The following clause refers especially to the construction of a steel viaduct:\*

Contractors are also required to check all leading dimensions and clearances as a whole and in detail, the fitting of all details, and to become responsible for the exact position and elevation of all parts of the work, which will only primarily be located by the engineer of the department of public parks. They will maintain their own field engineering, that of the city being for the purposes of original lay-out, inspection, and checking. The contractor must provide and maintain such facilities for the engineer or his assistants as he may require for the convenient examination and inspection of the work in progress. He will pay the cost of testing all material in laboratories or shops, and the cost of such mill and shop inspection as he may be called upon to perform in addition to that furnished by the engineer, the selection of such laboratory or inspectors being dictated by the engineer, to whom they will report. He will furnish such monthly progress photographs as may be required to maintain the record. A. P. B.

108. The Contract Subject to Interpretation and Change by the Engineer in the Following Particulars:†

- (a) Where meaning is obscure and uncertain.
- (b) As to what is implied beyond that which is specifically described.
- (c) In case of discrepancies between plans and specifications.
- (d) In case changes of plans or methods of work are afterwards decided upon.

Since the engineer is the author of the specifications, he evidently is the proper party to interpret their meaning. It goes without saying that the specifications and plans should be as clear and definite as possible in all particulars, but it is quite impossible to free language from many inherent defects, neither is it practicable to describe minutely and in detail all

\*In this case both foundations and superstructure formed one contract. If the owner should prepare the foundations he must guarantee his surveys and locations to be as shown on the drawings, or as described in the specifications. In this case provision must also be made for a comparison of the standards of length used by the owner and by the contractor.

†See Arts. 32, 33, 34, 38 and 39.

parts of the work. There will, therefore, usually be some uncertainty as to the real meaning of the words used in the specifications, or even of the drawings themselves, and many of the details of the work must be understood by implication, rather than described in either the specifications or the plans.

Occasionally also by some oversight the plans and specifications will not agree. This usually results from changes of plan after one or the other has been drawn, such changes being made in the one place and not in the other. As a rule the specifications control, rather than the plans, and the figures on the plans control, rather than the actual dimensions of the drawings when taken to scale. The engineer should, however, be at liberty to determine what the real meaning was intended to be in all cases of discrepancies.

Very few contracts for large works are carried out from beginning to completion without changes being introduced in both the plans and in the specifications during the progress of the work. These changes may arise from a newly devised method or plan which may be considered superior, or from unlooked for obstacles met with in the work, or from suggestions on the part of the contractor himself. They also are frequently made in order to reduce the cost of the work, and on the other hand are sometimes made in order to improve its character. It should be understood, therefore, that the engineer has the privilege of making such changes in the plans and specifications at any time.

So far as the engineer may add to the plans or specifications by way of interpretation of their true meaning, as in (a) and (b), such supplementary and explanatory matter should not involve any change in the contract price.

In the matter of discrepancies, however, between plans and specifications, if the contractor can show that he based his estimate on one of these to the exclusion of the other, and when interpreted by the engineer, he finds he had estimated on a plan

materially cheaper than that now required, it would be but just and right to allow him the difference in the cost, since he had the right to suppose that the plans and specifications were in accord.

When changes are introduced in the plans or specifications after the contract is let, such changes create a new contract, and as a matter of course there must be a new agreement as to compensation.\* Without a special clause authorizing such changes neither party could change the terms of the contract against the will of the other without breaking it. Furthermore without some understanding as to how the compensation should be determined for such change in plans or specifications, the party of the first part would be at the mercy of the contractor in this matter, and he could charge an extravagant price for such changes, and there would be no remedy. The following is a suitable clause, covering all these matters:

Said contractor also agrees that said chief engineer shall decide as to the meaning and intent of any portion of the foregoing specifications, or of the plans, where the same may be found obscure or in dispute; and said chief engineer shall have the right to correct any errors or omissions therein, when such corrections are necessary to the proper fulfillment of the intention of said plans and specifications; the action of such correction to date from the time said chief engineer gives due notice thereof. And it is also agreed by said contractor that said board may, at any time, make any changes in the location, form, dimensions, grades, and alignments, and may make any variations in the quantity of the work to be done, as exhibited in the advertisement or notice of letting hereto attached, or in the form of proposal or bid for said work, and may entirely exclude any of the items of work relating to said quantities at any time, either before the commencement of the work, or during its progress, without thereby altering or invalidating any of the prices herein named, or this contract in any other respect; should such action diminish the amount of work that would otherwise be done, no claim shall be made for damages on the ground of loss of anticipated profits on work so dispensed with; and should such action be taken after the commencement of any particular piece of work, and result thereby in extra cost to said contractor, said chief engineer shall certify to said board the amount to be allowed therefor, which he shall

\*See Sec. 38 as to the release of the sureties by such changes, and the provisions for changes in the bond itself, on p. 509.



consider fair and equitable, as between the parties, and decision, when approved by said board,\* shall be final and conclusive. E. K.

**109. Settlement of Disputes.**† While the contract lies between the party paying for the work, being the party the first part, and the contractor who does the work, being a party of the second part, the contract itself is administered and enforced by the engineer, who is usually employed by the party of the first part. It is well understood also that the engineer is supposed to act always in a strictly professional and administrative capacity, that he has no personal interest in favor of or against either party, and that his sole object is to see that the contract is faithfully carried out in accordance with its express terms and real meaning. It is also recognized that he is the most competent person to determine all differences and disputes, where these arise between the parties to the contract or between two or more contractors engaged upon the same work. It is proper and right, therefore, that he should be made the referee in all cases of dispute or misunderstanding and that his position as arbitrator should be made final and conclusive in the premises. If it be expressly agreed upon between the parties themselves that the engineer shall act in this capacity, then his decision does become binding and final upon the parties, even to the exclusion of the action of the courts, unless it can be shown that the engineer acted through prejudice, or ignorance, or fraud. As it is usually very difficult to establish a case against the engineer on either of these grounds, a clause such as the following usually acts to settle all disputes and to keep such controversies out of the courts. Honesty and fairness is also so common a characteristic of engineers that a clause such as the following is nearly always acceptable to both parties, and very seldom results in injustice being done to either party.

\*This decision of the engineer is usually made final and conclusive without approval by his principal.

†See articles 12 and 13.

To prevent all disputes and litigation, it is further agreed by and between the parties to this contract, that said chief engineer shall be the referee, in all cases, to determine the amount, quality, acceptability, and fitness of the several kinds of work which are to be paid for under this contract, and to decide upon all questions which may arise as to the fulfillment of said contract on the part of said contractor, and his decision and determination, when approved by said board\* shall be final and conclusive. Said contractor shall also afford all reasonable facilities for access to his work to any other parties or contractors who may be doing extra work or be working on a section of the conduit adjacent to his own, and any difference which may arise between two contractors in regard to their adjoining work is to be adjusted by said chief engineer, whose decision in the matter shall be final and binding upon both parties.†

E. K.

**110. Extra Work.†** While all changes in plans and specifications have been provided for in section 108, it is well to insert a special clause on the subject of extra work. It is common for contractors, on the completion of a piece of work, to bring in a bill of extras, which they claim represents work which they were asked to perform, and which was not included in the plans or specifications, and which was not specially provided for by particular agreement with the engineer with the corresponding compensation to be paid for it. What the contractor's ideas or intentions may be on this subject does not usually develop until the work has been fully completed and the time of final settlement has arrived. In many instances it is then too late to determine the exact facts concerning this extra work, either because of the incompleteness of the records,

\* See footnote, page 102.

† In the opinion of the author of this work it is doubtful if a clause such as is here given will always stand in a court of law. The reader is referred on this subject to Arts. 12 and 13 in the Synopsis of the Law of Contracts. In accordance with the principles there laid down it would seem that the courts will only sustain such a clause as the above when it can be shown that the acts of the engineer taken under it have been such as a court could properly refer to an expert referee, or to a person presumably more competent than the court to determine. In general such questions would be such

or because of the impracticability of making the necessary measurements. Such a bill of extras, therefore, brought in at the time of settlement is always the source of a certain amount of difficulty and irritation, and when the piece of work extends over a considerable length of time, such a contingency as above described should be prevented by requiring all such bills of extras to be presented from month to month. Furthermore, it is desirable also that the contractor should reveal to the engineer his intentions in regard to claims for extras, before such extra work is executed. In this case if he will not accept of the price fixed by the engineer for doing such work the engineer should have the privilege of letting this extra work to another party. In this way extravagant prices for such work could be prevented, and disputes avoided, and the following is given as a good example of such a clause, on a piece of work which extended over a considerable period of time:

No claim for extra work shall be considered or allowed, unless such extra work shall have been previously ordered by said engineer, in writing. The claims for such extra work, when so ordered, shall be presented to such board on or before the 15th day of the month following that in which said extra work was done, otherwise such claims during that month will be forfeited and waived. In case any extra work shall be required in the proper performance of the work contemplated to be done under this contract, it is understood that said board reserves the right to have such extra work done by any other person, firm, or corporation than the said contractor, unless an agreement upon the prices to be paid for such extra work can promptly be reached between said board and contractor. Should said extra work be let to any other person, firm, or corporation than said contractor, said contractor further agrees that he will not, in any way, interfere with, or molest such person, firm, or corporation, and that said contractor will suspend such part of the work herein specified, or will carry on the same in such a manner as he may be ordered by said engineer, so as to afford all reasonable facilities for doing such extra work; but said contractor agrees to make no claim for damages, or for any privileges or rights, other than expressed by this contract, by reason of the suspension and the doing of such extra work, except for an extension of time to perform this contract, as may be certified to said board in writing by said chief engineer, and approved by said board.

E. K.

**111. Definition of "Engineer" and "Contractor."**

While it is not at all necessary as a rule to define the terms "Engineer," "Contractor," "Board," etc., it is usually well to insert such a definition, to prevent any legal quibble in case suit is brought by either of the parties to the contract. In this definition also the agency of persons acting for either of the principals or for the engineer is also defined.

Wherever the word "engineer" is used herein, it shall be and is mutually understood to refer to——and to his properly authorized agents, limited by the particular duties entrusted to them.

Wherever the word "contractor" is used herein, it shall be and is mutually understood to refer to the party or parties contracting to perform the work to be done under this contract, or the legal representatives of such party or parties.

E. A. F.

**112. Documents Composing the Contract.** While in common law all the documents, acts, agreements, public advertisements, etc., which relate to or serve to explain the full meaning and intent of the contract, are made portions of such contract, it is well also to specify particularly what documents combine to make what is understood by the parties as "the contract." This clause is frequently inserted in the enacting agreement, which may or may not precede the specifications proper. It is here inserted as a clause in the specifications, but perhaps more properly belongs in what is sometimes designated more specifically as "the contract." The clause may read as follows:

It is understood by the contracting parties that the following documents are essential portions of the complete contract: The advertisement, the instructions to bidders, the proposal, all drawings, maps, and plans, hereto attached or herein described, the specifications, specific contract, and the contractor's bond.

**113. Meaning Understood.** It is not unusual for contractors to enter a plea, either during construction or on final settlement, that such and such parts of the specifications were not understood, and that their bids were made under a